

Baltic Pilot: The Baltic Sea from Falsterbo Point and Cape Arkona to ...

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H. O. No. 142

BALTIC PILOT

Volume I

THE BALTIC SEA FROM FALSTERBO POINT AND
CAPE ARKONA TO THE ENTRANCES
OF THE GULFS OF FINLAND
AND BOTHNIA

PUBLISHED BY THE HYDROGRAPHIC OFFICE
UNDER THE AUTHORITY OF THE
SECRETARY OF THE NAVY



WASHINGTON
GOVERNMENT PRINTING OFFICE
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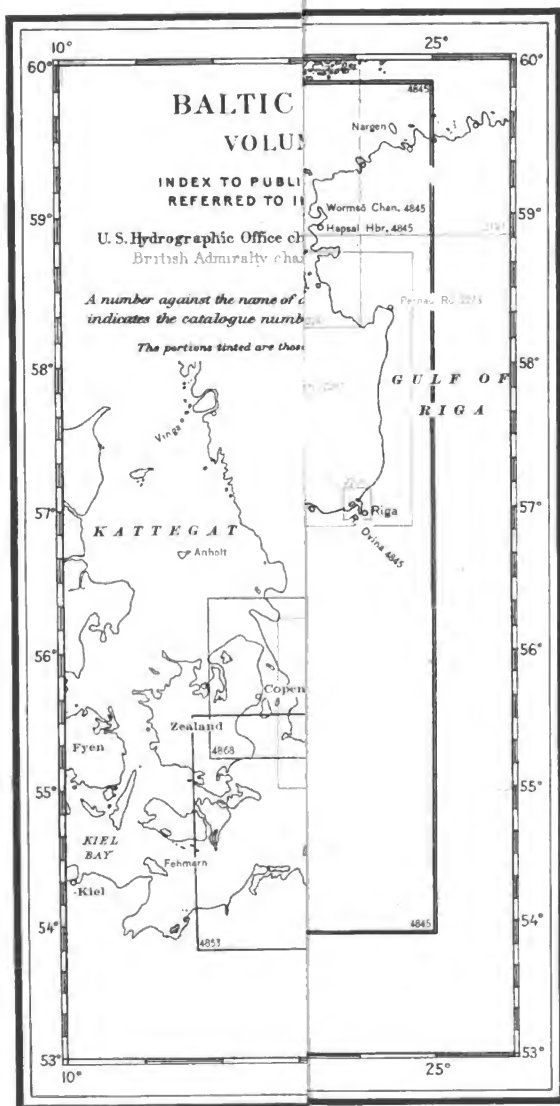
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PREFACE.

This publication contains the sailing directions for the Baltic Sea from Falsterbo Point and Cape Arkona to the entrances of the Gulfs of Finland and Bothnia.

The information contained therein is taken mainly from *Baltic Pilot*, Part II, published by the British Admiralty. It contains the latest information from all reliable sources, including all Hydrographic Office Notices to Mariners up to No. 3 of 1917.

The text has not been altered to conform with changes incident to the war, such as the location of mine fields, extinguishing of lights, etc., information concerning which has been published from time to time in the Notices to Mariners.

These have been considered of a temporary nature and the Notices to Mariners should be consulted in connection with the text.

The bearings and courses are true, in degrees from 0° (north) to 360° (clockwise).

Bearings limiting the sectors of lights are toward the light.

The directions of the winds refer to the points from which they blow; of currents, the points toward which they set. These directions are true.

Variations for the year, with the annual rate of change, may be obtained from H. O. Chart No. 2406, Variation of the Compass.

Distances are expressed in nautical miles, the mile being approximately 2,000 yards.

Soundings are referred to mean sea level.

Heights are referred to mean sea level.

The latest information concerning lights, characteristics, sectors, and fog signals should always be sought in the *List of Lights*.

Attention is invited to the coupons on the first pages of this book, which entitle the purchaser to a summary of the Notices to Mariners affecting this publication. They will be ready for distribution as soon as practicable after the first of each year, beginning January, 1918.

In the interest of mariners, information regarding inaccuracies in this publication should be sent to the United States Hydrographic Office, Washington, D. C.

GLOSSARY OF WORDS AND TERMS OCCURRING IN THE CHARTS AND SAILING DIRECTIONS.

DANISH.

Danish.	English.	Danish.	English.
Aa.....	River.	Misvisning.....	Variation (compass).
Aas.....	Ridge.	Mølle.....	Mill.
Baake.....	Beacon.	Mund.....	Mouth.
Bæk.....	Brook.	Munding.....	Mouth.
Baek.....	Rock (sunken).	Nakke.....	Nape (of neck).
Bakke.....	Hill.	Nes, nes.....	Cape, point.
Bank.....	Bank (shoal).	Nase.....	Nose.
Bjerg.....	Mountain.	Næb.....	Beak.
Borg.....	Fortified place.	Nor.....	Shallow sheet of water connected with the sea.
Breding.....	Wide place in a river or channel.	Nord.....	North.
Bro.....	Bridge or pier.	Nörre.....	Northern.
Bugt.....	Bend (in the coast).	Ny.....	New.
By.....	Town.	O.....	Island.
Diemning.....	Breakwater or mole.	Øde.....	Cape, point.
Dampskib.....	Steam vessel.	Øre.....	Ear.
Dyb.....	Deep.	Ørlogman, ørlogsskib.....	War vessel.
Elv.....	River.	Øst, øster.....	East.
Færge.....	Ferry.	Østre.....	Eastern.
Fariede.....	Channel.	Østers.....	Oyster.
Farvand.....	Channel.	Pille.....	Pier, sometimes pillar or column.
Flod.....	River.	Plade.....	Flat.
Fyr.....	Light.	Pont.....	Point of land.
Fyrhus.....	Lighthouse.	Radio telegraf.....	Wireless telegraph.
Fyrtaarn.....	Light tower.	Raket.....	Rocket.
Fyrskib.....	Light vessel.	Rednings station.....	Life-saving station.
Gaard.....	Farm, sometimes country house.	Red.....	Roadstead.
Gamle.....	Old.	Rende.....	Channel.
Gab.....	Opening.	Retvisende.....	True.
Grund.....	Shoal.	Rev.....	Reef.
Hage.....	Hook (as of Holland), or hook-pointed shoal.	Revie.....	Ledge, bar.
Hale.....	Tail.	Sand.....	Sand.
Hals.....	Neck.	Seilskib.....	Sailing vessel.
Halvø.....	Peninsula.	Skanse.....	Fort.
Hav.....	Sea.	Skjær.....	Rock above water.
Havn.....	Harbour.	Skjærgaard.....	Fringing rocks, islets, and shoals.
Høj, høj.....	High, or hill.	Skov.....	Wood.
Holm.....	Islet.	Skrænt.....	Slope, bluff.
Hoved.....	Head.	Slot.....	Castle.
Indre.....	Inner.	Sø.....	Sea or lake.
Inderst.....	Innermost.	Søkort.....	Chart.
Indløb.....	Entrance.	Søndre.....	Southern.
Indsø.....	Lake.	Spids.....	Point.
Jernbane.....	Railway.	Stad.....	Town.
Kai.....	Quay.	Stang.....	Pole.
Kalv.....	Calf.	Sten.....	Stone.
Karantæne.....	Quarantine.	Stor.....	Great.
Kirke.....	Church.	Sund.....	Sound.
Klint.....	Summit or brow of a steep hill or cliff.	Syd.....	South.
Klippe.....	Cliff or rock.	Taae.....	Fog.
Klit.....	Sandhill.	Tang.....	Seaweed.
Kratskov.....	Thicket.	Telefon.....	Telephone.
Krigsskib.....	War vessel.	Toldbod.....	Customhouse.
Kyst.....	Coast.	Toldvagtning.....	Customs service.
Kystvagt.....	Coastguard.	Tungo.....	Tongue.
Lille.....	Little.	Val.....	Steep coast.
Løb.....	Channel.	Vest.....	West.
Lods.....	Pilot.	Vestre.....	Western.
Lund.....	Grove.	Vig.....	Creek, bay.
Lythus.....	Summerhouse.	Vrag.....	Wreck.
Mærke.....	Mark.	Ydere.....	Outer.
Mellem.....	Between.	Yderst.....	Outermost.
Mjlderst.....	Central.		
Misvisende.....	Magnetic.		

Glossary of words and terms—Continued.

DANISH—Continued.

WORDS AND PHRASES WHICH MAY BE USED IN QUESTIONING PILOTS.

Danish.	English.	Danish.	English.
Agter.....	Aft.	Løjtnant.....	Lieutenant.
Agterom.....	Astern of.	Maskinmester.....	Engineer.
Agterude.....	Astern.	Nathus.....	Binnacle.
Agter stevn.....	Stern.	Paa grund.....	Aground.
Baad.....	Boat.	Peiling.....	Bearing.
Babord.....	Port.	Raa.....	Yard.
Bakning.....	Sternboard.	Raanok.....	Yardarm.
Bom.....	Boom or spar.	Rat.....	Wheel.
Bov.....	Bow.	Ror.....	Rudder.
Bugsero.....	Tow.	Skorsten.....	Chimney, funnel.
Dybgaende.....	Draught of water.	Skrog.....	Hull.
Dyblod.....	Deep sea lead.	Stag.....	Stay.
Forom.....	Ahead of.	Stevn.....	Stem.
Forudse.....	Ahead.	Styrbord.....	Starboard.
Handled.....	Hand lead.	Styreplind.....	Tiller.
Hive lodet.....	Heave the lead, to.	Styrman.....	Mate.
Kaptajn.....	Captain.	Styremenne.....	Wheel ropes.
Kompass.....	Compass.	Tilvers.....	Aloft.
Læland.....	Lee shore.	Uderstyrman.....	Quartermaster.
Lod.....	Lead.		

ANCHORS, ANCHORING, CABLES, ETC.

Anker.....	Anchor.	Kjæde.....	Chain.
Anker bôle.....	Anchor buoy.	Klyds.....	Hawse (pipes).
Ankerflig.....	Anchor flukes.	Korte ind.....	Shorten in.
Ankerstok.....	Anchor stock.	Lette anker.....	Weigh anchor.
Ankertoug.....	Cable.	Løbe ud.....	Let go.
Bovanker.....	Bower anchor.	Løse.....	To unmoor from pier of buoy.
Drag.....	Grapple.	Pal.....	Pawl.
Fortøle.....	To moor to a pier or buoy.	Stike.....	Veer.
Gangspil.....	Capstan.	Stop anker.....	Stream anchor.
Hive ind.....	Heave in.	Uklar anker.....	Foul anchor.
Hive ind til Kort stagsvis.....	Heave in to a short stay.	Varp.....	Warp.
Kabel.....	Cable.	Varp anker.....	Kedge anchor.
Kabelaring.....	Messenger.		

BUOYS.

Bøje.....	Buoy.	Klokke tønne.....	Bell buoy.
Fløjte tønne.....	Whistle buoy.	Lys tønne.....	Light buoy.
Förtøjnings tønne.....	Mooring buoy.	Tønne.....	Buoy.

ENGINE-ROOM ORDERS.

Fremad.....	Ahead.	Stop.....	Stop.
Fuld kraft.....	Full speed.	Tilbage.....	Astern.
Halv kraft.....	Half speed.		

MAST.

Bram.....	Top-gallant.	Mesen.....	Mizen.
Fokke.....	Fore.	Overbram.....	Royal.
Mæsse.....	Top.	Stor.....	Main.
Mast.....	Mast.		

MEASURES OF LENGTH.

Favn.....	Fathom.	Mil.....	Mile.
Fod.....	Foot.	Tomme.....	Inch.

Glossary of words and terms—Continued.

DANISH—Continued.

SAILS.

Danish.	English.	Danish.	English.
Bjerger seil.....	Shorten sail.	Reb.....	Reef (of a sail).
Giv op.....	Clew up.	Rebe.....	To reef a sail.
Jager.....	Flying jib.	Seil.....	Sail.
Klyver.....	Jib.	Skod.....	Sheet of a sail.
Hals.....	Tack (of a sail).	Skodhorn.....	Clew of a sail.
Mesen seil.....	Spanker.		

TIDES, TIDAL STREAMS, ETC.

Ebb.....	Ebb.	Lav vand.....	Low water.
Faldende vand.....	Falling tide.	Stigende vand.....	Rising tide.
Flod.....	Flood.	Ström.....	Stream.
Hoi, høj, vand.....	High water.	Strömkobling.....	Tide race.

WINDS.

Byge.....	Squall.	Storm.....	Storm.
Kuling.....	Breeze.	Vind.....	Wind.

WORKING SHIP.

Faa bak i sellen.....	To be taken aback.	Mod vinden.....	To windward.
Fuld og by.....	Full and by.	Myslykkaat stagvende.	To miss stays.
Kovende.....	To wear ship.	Skjærpe.....	To brace up.
Lavere.....	To beat to windward.	Stagvende.....	To tack.
Lægge bi.....	To lie to.	Til lævart.....	To leeward.
Luff.....	Luff.		

PRONUNCIATION.

a.....	as a in <i>clan, pan</i> , etc.	o.....	as o in <i>lock</i> .
aa.....	as a in <i>fall</i> .	ö.....	as <i>au</i> in <i>cour</i> (French).
æ.....	as a in <i>late</i> .	u.....	as oo in <i>spoon</i> .
e.....	as e in <i>they</i> .	y.....	as oo in <i>foot</i> .
i.....	as ee in <i>feel</i> .		

SWEDISH.

Swedish.	English.	Swedish.	English.
Ångfartyg.....	River.	Flod.....	River.
Ås.....	Steam vessel.	Fyr.....	Light.
Bäcke.....	Ridge.	Fyrhus.....	Lighthouse.
Bæk.....	Hill.	Fyrskæppe.....	Light-vessel.
Båk.....	Brook.	Fyrtorn.....	Light-tower.
Bänk.....	Beacon.	Gammal.....	Old.
Bank.....	Bank (shoal).	Gap.....	Opening.
Berg.....	Mountain.	Gård.....	Farm, sometimes country house.
Borg.....	Fortified place.	Grund.....	Shoal.
Braut.....	Slope, steep.	Haf.....	Sea.
Bredning.....	Wide place in a river or channel.	Hake.....	Hook (as of Holland), or hook-pointed shoal.
Bro.....	Bridge or pier.	Hallö.....	Peninsula.
Brük.....	Works, factory.	Hals.....	Neck.
Bugt.....	Bend (in the coast).	Hamn.....	Harbour.
By.....	Village.	Hög.....	High, or hill.
Dämning.....	Breakwater or mole.	Holm.....	Islet.
Djup.....	Deep.	Hufvud.....	Head.
Elf.....	River.	Inlopp.....	Entrance.
Farja.....	Ferry.	Innerst.....	Innermost.
Farled.....	Channel.	Inre.....	Inner.
Farvatten.....	Channel.	Insjö.....	Lake.
Fast prick.....	Fixed perch.	Jernbana or jernväg.....	Railway.
Flat.....	Flat.		

Glossary of words and terms—Continued.

SWEDISH—Continued.

Swedish.	English.	Swedish.	English.
Kaj.....	Quay.	Rätvisande.....	True.
Kajdam.....	Pier.	Redd.....	Roadstead.
Kalf.....	Calf.	Ref.....	Reef.
Karantän.....	Quarantine.	Sand.....	Sand.
Klint.....	Summit or brow of a steep hill or cliff.	Segelfartyg.....	Sailing vessel.
Klippa.....	Cliff or rock.	Sjö.....	Sea or lake.
Krigsskepp.....	War vessel.	Sjögräs.....	Seaweed.
Kulle.....	Hillock, knoll.	Sjökart.....	Chart.
Kust.....	Coast.	Skans.....	Fort.
Kustvakt.....	Coastguard.	Skär.....	Rock above water.
Kvarn.....	Mill.	Skärgård.....	Fringing rocks, islets, and shoals.
Kvast.....	Broom.	Skog.....	Wood.
Kyrka.....	Church.	Skrent.....	Slope, bluff.
Lilla.....	Little.	Slott.....	Castle.
Lopp.....	Channel.	Söder.....	South.
Lund.....	Grove.	Södra.....	Southern.
Lusthus.....	Summer-house.	Spets.....	Point.
Märke.....	Mark.	Stad.....	Town.
Medlerst or mellerst.....	Central.	Stång.....	Pole.
Meilan.....	Between.	Sten.....	Stone.
Misvisande.....	Magnetic.	Stor.....	Great.
Misvisning.....	Variation (compass).	Sund.....	Sound.
Möl.....	Mill.	Svans.....	Tail.
Mun.....	Mouth.	Syd.....	South.
Mynning.....	Mouth.	Sydlig.....	Southern.
Näbb.....	Beak.	Sydöst.....	South-east.
Nake.....	Nape (of the neck).	Sydväst or sydväst.....	South-west.
Näs.....	Cape, point.	Tång.....	Seawrack.
Näsa or Nos.....	Nose.	Telefon.....	Telephone.
Nor, Nord.....	North.	Tjocka.....	Fog.
Nordöst.....	Northeast.	Tjockskog.....	Thicket.
Nordväst.....	Northwest.	Tullbevakning.....	Customs service.
Norra.....	Northern.	Tullkammare.....	Custom-house.
Ny.....	New.	Tunga.....	Tongue.
Ö.....	Island.	Udde.....	Cape, point.
Öra.....	Ear.	Vagbrytare.....	Breakwater.
Öster.....	East.	Vägel.....	Perch.
Östra.....	Eastern.	Vall.....	Steep coast.
Ostra.....	Oyster.	Väst, Väst.....	West.
Platt.....	Flat.	Vestra, Västra.....	Western.
Prick.....	Spar buoy.	Vestligt.....	Westerly.
Radlotelegraf.....	Wireless telegraph.	Vik.....	Creek, bay.
Räddnings station.....	Life-saving station.	Vrak.....	Wreck.
Raket.....	Rocket.	Ytterst.....	Outermost.
Ränna.....	Channel.	Yttre.....	Outer.

WORDS AND PHRASES WHICH MAY BE USED IN QUESTIONING PILOTS.

Akter.....	Aft.	Loda.....	To heave the lead.
Akterom.....	Astern of.	Löjtnant.....	Lieutenant.
Akterstäm.....	Stern.	Maskinist.....	Engineer.
Akterut.....	Astern.	Nackterhus.....	Binnacle.
Babörp.....	Port.	På grund.....	Aground.
Backslag.....	Sternboard.	Peiling.....	Bearing.
Båt.....	Boat.	Rå.....	Yard.
Bog.....	Bow.	Rånock.....	Yardarm.
Bom.....	Boom or spar.	Ratt.....	Wheel.
Bogsere.....	Tow.	Roder.....	Rudder.
Bogserbåt.....	Tug.	Skorsten.....	Chimney, funnel.
Djupgående.....	Draft of water.	Skrof.....	Hull.
Djuplod.....	Deep-sea lead.	Stag.....	Stay.
Förum.....	Ahead of.	Stam.....	Stem.
Förut.....	Ahead.	Styrbord.....	Starboard.
Handlod.....	Handlead.	Styrman.....	Mate.
Kapten.....	Captain.	Styrpinne.....	Tiller.
Kompass.....	Compass.	Styrrep.....	Wheel ropes.
Lägrvall.....	Lee shore.	Till vaders.....	Aloft.
Lod.....	Lead.	Understyrman.....	Quartermaster.

Glossary of words and terms—Continued.

SWEDISH—Continued.

ANCHORS, ANCHORING, CABLES, ETC.

Swedish.	English.	Swedish.	English.
Ankar.....	Anchor.	Ketting.....	Chain cable.
Ankar boj.....	Anchor buoy.	Klys.....	Hawse pipe.
Ankarfly.....	Anchor fluke.	Korta in.....	Shorten in.
Ankarstock.....	Anchor stock.	Loppa ut.....	Let go.
Ankarfåg.....	Cable.	Lösa.....	To unmoor from a pier or buoy.
Bogankare.....	Bower anchor.	Lyfta ankar.....	Weigh anchor.
Dragg.....	Grapnel.	Okjar ankar.....	Foul anchor.
Förtöja.....	To moor to a pier or buoy.	Pall.....	Pawl.
Gångspel.....	Capstan.	Sticka.....	Veer.
Hyfra.....	Heave in.	Ström ankar.....	Stream anchor.
Hyfra till kort stagsvis.	Heave in to short stay.	Varp.....	Warp.
Kabel.....	Cable.	Varp ankar.....	Kedge anchor.
Kabellarium.....	Messenger.		
Kedja.....	Chain.		

BUOYS.

Ballongprick.....	Spar buoy with ball topmark.	Kvastprick.....	Spar buoy with broom topmark.
Boj.....	Buoy.	Ljud boj.....	Whistle buoy.
Förtöjnings boj.....	Mooring buoy.	Lys boj.....	Light buoy.
Klock boj.....	Bell buoy.	Prick.....	Spar buoy.
Kryssprick.....	Spar buoy with cross.	Slatprick.....	Plain spar buoy.

ENGINE-ROOM ORDERS.

Framåt.....	Ahead.	Stop.....	Stop.
Fulla Kraft.....	Full speed.	Tillbaka.....	Astern.
Half Kraft.....	Half speed.		

MASTS.

Bramstang.....	Topgallant mast.	Mesänmast.....	Mizenmast.
Fockmast.....	Foremast.	Överbram.....	Royal mast.
Märsstang.....	Topmast.	Stormast.....	Mainmast.
Mast.....	Mast.		

SAILS.

Giga.....	Clew up.	Ref.....	Reef (of a sail).
Halsa.....	Tack.	Refva.....	To reef a sail.
Jagare.....	Flying jib.	Segel.....	Sail.
Klyfvare.....	Jib.	Skot.....	Sheet (of a sail).
Mesän.....	Spanker.	Skothorn.....	Clew (of a sail).
Mjnska segel.....	Shorten sail.	Tillsätta segel.....	To make sail.

MEASURES AND LENGTHS.

Famn.....	Fathom.	Mil.....	Mile.
Fot.....	Foot.	Tum.....	Inch.

WINDS.

By.....	Squall.	Storm.....	Storm.
Kultje.....	Breeze.	Vind.....	Wind.

WORKING SHIP.

Bidevind och full.....	Full and by.	Mot vinden.....	To windward.
Brassa hårdt i vinden...	To brace sharp up.	Stå sig upp i lofvart.....	To beat to windward.
Få back i seglen.....	To be taken aback.	Stagvända.....	To tack.
Lägga bi.....	To lie to.	Till lävart.....	To leeward.
Lof.....	Luff.	Vända fördevind.....	To wear ship.
Misslyckas at stagvända	To miss stays.		

Glossary of words and terms—Continued.

SWEDISH—Continued.

TIDES, TIDAL STREAMS, ETC.

Swedish.	English.	Swedish.	English.
Ebb.....	Ebb.	Lågt vatten.....	Low water.
Fallande vatten.....	Falling tide.	Stigande vatten.....	Rising tide.
Flod.....	Flood tide.	Ström.....	Stream.
Högt vatten.....	High water.	Strömsättning.....	Tide race.

PRONUNCIATION.

a.....	as a in <i>clan</i> , <i>pan</i> .	o.....	as o in <i>lock</i> .
å.....	as a in <i>fall</i> .	ö.....	as <i>α</i> in <i>crur</i> (French).
ä.....	as a in <i>faie</i> .	u.....	as oo in <i>spoon</i> .
e.....	as e in <i>they</i> .	y.....	as oo in <i>foot</i> .
i.....	as ee in <i>feel</i> .		

The consonants are generally pronounced similarly to consonants in English, except in some cases: *d* is pronounced like *th* in *the* unless it is the first letter of the word, when it is pronounced similarly to *d* in English; *g* is pronounced like *y* in English, before *e*, *j*, *ä*, *ö*, *y*; *j* is sounded as the vowel *i*; *k*, before *ä*, *e*, *i*, *j*, *ö*, and *y* in the same syllable, is sounded as *ch* in the English word *cher*; thus, the town of Norrköping is pronounced Norrköping; *l* is not heard before *j*; *sj* has the sound of English *sh*; *sk* has the sound of English *sh* when followed by *ä*, *e*, *i*, *j*, *ö*, *y*.

Examples showing the regular methods of adding inflections, adjectives, etc., and of forming plurals:

Hus.....	House.	Ö.....	Island.
Ett hus.....	A house.	En ö.....	An island.
Huset.....	The house.	Öen.....	The island.
Huse.....	Houses.	Öar.....	Islands.
Husene.....	The houses.	Öarne.....	The islands.
Et stort hus.....	A big house.	En stort ö.....	A large island.
Det stora hus.....	The big house.	Den store ö.....	The large island.
Stora huse.....	Big houses.	Store öar.....	Large islands.
De stora huse.....	The big houses.	De store öar.....	The large islands.

No rule can be given as to whether a noun takes *en* or *ett*; this depends on the gender, and many are irregular.

GERMAN.

German.	English.	German.	English.
Alt.....	Old.	Funkentelegraph.....	Wireless telegraph.
Ankergrund.....	Anchorage.	Furt.....	Ford.
Äue.....	Meadow, river, islet.	Gasthaus.....	Inn.
Äusser.....	Outer.	Gehöft.....	Farm premises or yard.
Äusserst.....	Outermost.	Gehölz.....	Small wood, copse.
Backbord.....	Port (helm).	Geringe, klein.....	Little.
Bake.....	Beacon.	Gross.....	Great.
Bakenbönne.....	Beacon buoy.	Gut.....	Farm land.
Bank.....	Bank (shoal).	Hafen.....	Harbor, port.
Berg.....	Mountain.	Haft.....	Haft (a lagoon partly closed by a strip of land; fresh-water lake, Baltic only).
Boje.....	Buoy.	Haken.....	Hook (fishing, etc.).
Bruch.....	Marsh.	Halbinsel.....	Peninsula.
Brücke.....	Bridge, pier.	Haus.....	House.
Brunnen.....	Well, spring.	Höhe, höhen.....	Height, summit, altitude heights.
Bucht.....	Bay, bight.	Holz.....	Wood, a wood.
Burg.....	Castle, fortified place.	Höved.....	Head.
Damm.....	Pier, embankment.	Hügel.....	A hillock.
Dampfschiff.....	Steamship.	Huk.....	Hook, point.
Dampfer.....	Steam vessel.	Inner.....	Inner.
Dorf.....	Village.	Innerst.....	Innermost.
Eck.....	An angular figure, as triangle.	Insel, Inseln.....	Island, islands.
Ecke.....	Angle, corner, nook.	Kanal.....	Canal, channel.
Einfahrt, einlauf.....	Entrance.	Kap.....	Cape.
Eis.....	Ice.	Kies.....	Gravel.
Eisenbahn.....	Railway.	Kirche.....	Church.
Fähre.....	Ferry.	Klippe.....	Cliff, steep rock.
Fahrt.....	Voyage course.	Kluft.....	Ravine.
Felsen.....	Rock, cliff.	Kriegsschiff.....	War vessel.
Fernsprecher.....	Telephone.	Küstenwache.....	Coastguard.
Festung.....	Fortress.	Landungsplatz.....	Landing place.
Feuerschiff.....	Lightship.	Landzunge.....	Spit.
Flach.....	Flat, shallow.		
Fluss.....	River.		
Föhrde.....	Fjord.		

Glossary of words and terms—Continued.

GERMAN—Continued.

German.	English.	German.	English.
Leuchtfeuer.....	Light.	Rot.....	Red.
Leuchttonne.....	Light-buoy.	Sandbank.....	Sandbank, shoal.
Leuchtturm.....	Lighthouse.	Schanze.....	Trench, earthwork.
Lootse, lotse.....	Pilot.	Schloss.....	Castle.
Meerbusen.....	Gulf, bay.	See.....	Lake, sea.
Meerenge.....	Strait.	Seegat.....	Fairway (between banks)
Missweisend (abbreviated "mw").	Magnetic.	Segler.....	Sailing vessel.
Missweisung.....	Variation (compass).	Spitze.....	Point, headland, summit.
Mittel.....	Middle, mean, means.	Stein.....	Stone, rock.
Mund, mündung.....	Mouth.	Steuerbord.....	Starboard.
Mühle.....	Mill.	Stadt.....	Town, city.
Nebel.....	Fog.	Sturm.....	Storm.
Neu.....	New.	Süd.....	South.
Noor.....	Shallow sheet of water connected with the sea.	Swampf.....	Marsh.
Nord.....	North.	Sund.....	Sound, straits.
Ort.....	Spot, place, point. (A point on the map, not a point in a coastline or of a hill).	Thon.....	Clay.
Ost.....	East.	Tief.....	Deep, depth.
Pass.....	Pass, narrows.	Tonne.....	Buoy.
Quarantäne.....	Quarantine.	Turm.....	Tower.
Rakete.....	Rocket.	Ufer.....	Bank (of a river), shore.
Rechtweisend (abbreviated "rw").	True (bearing).	Untiefe.....	Shoal.
Rettungsstation.....	Life-saving station.	Vorgebirge.....	Promontory.
Rhede, reede.....	Roadstead.	Wald.....	Wood, forest.
Riff.....	Reef, ridge.	Weiss.....	White.
Rinne.....	Channel.	West.....	West.
		Wiek or Wik.....	Bay.
		Windmühle.....	Windmill.
		Winkbake.....	Signal beacon.
		Wrack.....	Wreck.
		Zollamt.....	Customhouse.
		Zolldienst.....	Customs service.

RUSSIAN WORDS IN CHARTS AND SAILING DIRECTIONS.

Russian.	English.	Russian.	English.
Admiralstvo.....	Government dockyard.	Gluboki.....	Deep.
Angliski konsul.....	English consul.	Golik.....	A caselike broom (on spar buoy).
Bakan.....	A buoy.	Golova.....	The head (of a pier).
Bakan s kolokolom.....	Bell buoy.	Gora.....	A hill, a mountain.
Baklan.....	A cormorant.	Gorizont.....	The horizon.
Banka.....	A shoal.	Gorod.....	A town, a city.
Bar.....	A bar.	Gruda.....	A cairn, a pile.
Bashnya.....	A tower.	Gryaz.....	Mud.
Bereg.....	The coast.	Guba.....	A bay, inlet.
Bezprovodni telegraf.....	Wireless telegraph.	Gudyasehi bakan.....	Whistle buoy.
Blizhni.....	Near.	Oze, mud.....	Ooze, mud.
Blokshtv.....	A hulk.	Izba.....	A hut.
Bochka.....	A buoy, a cask.	Kabeltov.....	A hawser, a cable's length.
Bochka (na mavitukh yakoryakh).	Mooring buoy.	Kamen.....	A rock, a stone.
Bolshoi.....	Great, large.	Kanal.....	A channel, a canal.
Bot.....	A boat.	Kanat.....	A chain cable.
Brosit yakor.....	To anchor.	Karantin.....	Quarantine.
Buek, bui.....	A buoy.	Karta.....	A chart.
Bukhta.....	A bay, a creek.	Kater.....	A boat.
Buksir.....	A tug, tow rope.	Kayuta.....	A cabin.
Burun.....	A breaker (surf).	Kholm.....	A hill.
Burya.....	A storm.	Kholodni.....	Cold.
Byeli.....	White.	Khoroshi.....	Good.
Chalka.....	A gull.	Khudoi.....	Bad.
Chelovyek.....	A man.	Kladbishche.....	A cemetery.
Cherni.....	Black.	Kladovaya.....	A storehouse.
Dalni.....	Distant.	Kolokol.....	A bell.
Den.....	A day.	Kolyeno.....	A reach (of a channel, &c.).
Derevo.....	A tree.	Kompas.....	A compass.
Derevnya.....	Village.	Konus.....	A cone.
Deviztziya.....	Deviation of compass.	Korabl.....	A ship.
Dlinni.....	Long.	Kordon.....	Coast-guard.
Dolgota.....	Longitude.	Kosa.....	A spit.
Dom.....	A house.	Krasni.....	Red.
Doroga.....	A road.	Krest.....	A cross.
Dozhd.....	Rain.	Krest.....	Round.
Farvater.....	A channel.	Krutoyar.....	Steep banks.
Gavan.....	A harbor.	Kryepki.....	Hard.
Glina.....	Clay.	Kurgan.....	A tumulus.
Glubina.....	Depth, soundings.		

Glossary of words and terms—Continued.

RUSSIAN—Continued.

Russian.	English.	Russian.	English.
Kurs.....	Course.	Podvodni.....	Submerged.
Kuterna.....	A snowstorm.	Polden.....	Noon.
Led.....	Ice.	Poini khod.....	Full speed.
Ledokhod.....	The driving of ice.	Polnoch.....	Midnight.
Ledokol.....	Ice breaker.	Polnaya voda.....	High water.
Ledianaya gora.....	An iceberg.	Polovina.....	Half.
Liman.....	Estuary.	Polovoda.....	High-water spring tides.
Lodka.....	A boat.	Poluostrov.....	A peninsula.
Lotzman.....	A pilot.	Polyana.....	An ice field.
Lotzmanski bot.....	A pilot boat.	Port.....	A port, a harbor.
Lot.....	A sounding lead.	Postoyanni ogon.....	A fixed light.
Luda.....	A rock or reef out of water.	Postoyanni s problemskimi ogon.....	A fixed and flashing light.
Luna.....	The moon.	Povorot.....	Turning, tacking, a bend.
Lyes.....	A forest.	Pozadi.....	Astern.
Lyestnoi.....	Wooded.	Pravi.....	Right, starboard.
Lyeto.....	Summer, year.	Pravo rulya.....	Port the helm.
Lyevl.....	Left, port.	Pravo na bort.....	Hard-a-port.
Lyevno rulya.....	Starboard the helm.	Pribol.....	Rollers.
Lyevno na bort.....	Hard-a-starboard.	Pribnii.....	Rising water.
Matros.....	A sailor.	Pribullaya voda.....	High water.
Mali.....	Little, small.	Pribrzhenie.....	The beach.
Mali khod.....	Half speed.	Priblizhenie.....	The flood tide.
Marevo, or mirazh.....	Mirage.	Priblizhennoe techenie.....	Tidal stream.
Mayak.....	A lighthouse.	Pristan.....	A landing stage, a pier.
Medved.....	A bear.	Pristavka.....	Come alongside.
Mel.....	A shoal.	Problek.....	A flash.
Melkoe myesto.....	A shallow place.	Problekovi ogon.....	A flashing light.
Melkovode.....	Shallow water.	Prokhod.....	A gullet, a passage.
Mign'yushchi.....	Quick flashing.	Proli.....	A strait.
Mokri.....	Wet.	Pryesnaya voda.....	Fresh water.
More.....	The sea.	P'yatno.....	A shoal, a patch.
Moroz.....	Frost.	Raketa.....	Rocket.
Morskaya voda.....	Sea water.	Rakovina.....	Shell.
Morskoi kot.....	A sea lion.	Reld.....	A roadstead.
Moryak.....	A seaman.	Rif.....	A reef.
Morzh.....	A walrus.	Rulba.....	A fish.
Mrak.....	Darkness, gloom.	Rul.....	A rudder, the helm.
Mut.....	A cape, a headland.	Rulevol.....	A helmsman.
Mutitsya.....	To become muddy.	Rumb.....	A compass point.
Myagki.....	Soft.	Ryeka.....	A river.
Myed.....	Copper.	Ryeshchatl.....	Cagelike.
Na bereg, or na mel.....	A shore.	Sanitarnaya kontora.....	Health office.
Naberezhnaya.....	A quay.	Sazhen.....	A fathom.
Napravlenie.....	Direction.	Seld.....	A herring.
Nizki, or Nizhni.....	Lower.	Selo.....	A village with a church.
Nizkaya voda.....	Low water.	Shar.....	A strait, a ball.
Noch.....	Night.	Shest.....	A pole, spar buoy.
Nos.....	A cape, a headland; bow of a vessel.	Shirota.....	Latitude.
Novi.....	New.	Shkval.....	A squall.
Obruiv.....	A bluff.	Shlyupka.....	A boat.
Ogon.....	Fire, a light.	Skala.....	Blue.
Osadka.....	Draught of water.	Sklonenie.....	A rock, a cliff.
Osen.....	Autumn.	Snyeg.....	Magnetic variation.
Ostrov.....	An island.	Soleni.....	Snow.
Osvyeshchaemi bakan.....	Light buoy.	Solntze.....	Salt (adj.).
Otdat yakor.....	To let go the anchor.	Spatelnaya lodka.....	The sun.
Otliv.....	Ebb tide.	Spatelnaya stantziya.....	Lifeboat.
Otmel.....	A shoal, extending from shore.	Shreil.....	Life-saving station.
Otvallval.....	Shove off!	Stan, or stanovichche.....	In the middle.
Ozero.....	A lake.	Starl.....	A station, a camp, a settlement.
Parokhod.....	A steamship.	Stop.....	Old.
Parusnoe sudno.....	A sailing vessel.	Stora.....	Stop.
Pelen.....	A bearing.	Stryelka.....	Side (of a channel, &c.).
Peredni.....	Front (adj.).	Stvor.....	A wind split.
Peremennii ogon.....	An alternating light.	Stvornue znaki.....	A leading line.
Peresheck.....	An isthmus.	Sudno.....	Leading marks.
Peschanl.....	Sandy.	Sukhol dok.....	A vessel.
Pesok.....	Sand.	Syerl.....	A dry dock.
Pestri.....	Chequered.	Svever.....	Grey.
Plavanie.....	Navigation.	Sveverni.....	North.
Plavni.....	A mud flat overgrown with reeds.	Tamozhnysh.....	Northern.
Plovuchi mayak.....	A light-vessel.	Techenie.....	Customhouse.
Pochtamt.....	A post office.	Telefon.....	Current.
Podnyat yakor.....	To weigh anchor.	Telegraf.....	Telephone.
		Temni.....	Telegraph.
			Dark (color).

Glossary of words and terms—Continued.

RUSSIAN—Continued.

Russian.	English.	Russian.	English.
Teply.....	Warm.	Vostok.....	East.
Tina.....	Ooze.	Vostochni.....	Eastern.
Tishina.....	A calm.	Vpered.....	Ahead.
Toistoi.....	Thick.	Vyeter.....	The wind.
Tombul.....	A buoy.	Vyokha.....	A perch, a spar buoy.
Tomkl.....	Thin.	Yagel.....	Lichen, white moss.
Tuman.....	A fog.	Yakor.....	An anchor.
Tyulen.....	A fur seal.	Yakornoe myesto.....	An anchorage.
Tzerkov.....	A church.	Yel.....	A fir tree.
Ubuil.....	Falling water.	Yug.....	South.
Ubulaya voda.....	Low water.	Yuzhni.....	Southern.
Uglublenie.....	Draught of water.	Zadni.....	Rear (adj.).
Ugol.....	Coal.	Zadni khod.....	Astern.
Utes.....	A cliff.	Zakol.....	A weir.
Utro.....	Morning.	Zalif.....	A bay, a gulf.
Uzel.....	A knot (a nautical mile).	Zapad.....	West.
Vecher.....	Evening.	Zapadni.....	Western.
Verkhni.....	Upper.	Zatmenie.....	Eclipse.
Vertyashchisya ogon.....	A revolving light.	Zatmevayushchisya.....	Occluding.
Vesna.....	Spring.	Zavod.....	A bay, a creek.
Vkhod.....	Entrance.	Zavod.....	A factory.
Vnutrenni.....	Inner.	Zavorot.....	A turning.
Vnyeshni.....	Outer.	Zeleni.....	Green.
Voda.....	Water.	Zemlya.....	Land.
Vodopemni.....	Under water, submerged.	Zheiti.....	Yellow.
Vodopol.....	Overflow of a river.	Zhelyezo.....	Iron.
Vodorosl.....	Seaweed.	Zima.....	Winter.
Vokzal.....	Railway station.	Znak.....	A beacon.
Volna.....	A wave.	Zoloto.....	Gold.
Vorota.....	Gates, entrance, passage.	Zvezda.....	A star.

COMPASS POINTS.

Nord (N).....	North.	Ost ten Nord.....	E. by N.
Nord ten Ost (N. t. O.)	N. by E.	Ost (O.).....	East.
Nord Nord Ost (N. N. O.)	N. N. E.	Ost ten Zyuid (O. t. S.)	E. by S.
		&c., &c.	
Nord Ost ten Nord (N. O. t. N.)	N. E. by N.	Zyuid (S.).....	South.
Nord Ost (N. O.).....	N. E.	Zyuid ten Vest (Z. t. W.)	S. by W.
Nord Ost ten Ost (N. O. t. O.)	N. E. by E.	&c., &c.	
Ost Nord Ost (O. N. O.)	E. N. E.	Vest (W.).....	West.
		Vest ten Nord (W. t. N.)	W. by N.
		&c., &c.	

INFORMATION RELATING TO NAVIGATIONAL AIDS AND GENERAL NAVIGATION.

THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

The following publications are issued by the United States Hydrographic Office as guides to navigation: Charts, Chart Catalogues, Sailing Directions, Light Lists, Tide Tables, Notices to Mariners, Pilot Charts, and Hydrographic Bulletins. Of these, the Notices to Mariners and the Hydrographic Bulletins are free to mariners and others interested in shipping. The Pilot Charts are free to contributors of professional information, but are sold to the general public at 10 cents a copy. The other publications of the office are sold under the law at cost price.

The Charts, the Sailing Directions, and the Light Lists are all affected by continual changes and alterations, concerning which information from all parts of the world is published weekly in the Notices to Mariners.

The charts are always corrected for all available information up to the date of issue stamped upon them; and the Light Lists should be noted for the recent alterations and additions. The Sailing Directions, however, can not, from their nature, be so fully corrected, and in all cases where they differ from the charts, the charts must be taken as the guide.

Charts.—When issued from the Hydrographic Office, the charts have received all necessary corrections to date.

All small but important corrections that can be made by hand are given in the Notices to Mariners, and should at once be placed on the charts to which they refer.

Extensive corrections that can not be conveniently thus made are put upon the plates, and new copies are put on sale. Masters of vessels are urged to replace the old charts, which should be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which extensive corrections are made are noted on the chart on the right of the middle of the lower edge; those of the smaller corrections at the left lower corners.

The edition, and corresponding date, of the chart will be found in the right lower corner, outside the outer neat line.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (found in the lower right and upper left corners), in order that the edition of the chart referred to may be known.

The Light Lists are corrected before issue, and all changes are published in the weekly Notices to Mariners.

The navigating officer should make notations in the tabular form in the Light Lists and paste in at the appropriate places slips from the Notices to Mariners.

The Light Lists should always be consulted as to the details of a light, as the description in the sailing directions is not complete, and may be obsolete, in consequence of changes since publication.

The Sailing Directions or Pilots are kept corrected by addenda; and subsequent to date of last addenda, they should be kept corrected by means of the Notices to Mariners. Sailing Directions issued to naval vessels carry with them an envelope containing slips of corrections up to date of issue.

Addenda are published from time to time, and contain a summary of all the information received up to date since the publication of the volume to which they refer, canceling all previous Notices to Mariners.

To enable the books to be more conveniently corrected, addenda and Notices to Mariners are printed on one side only, and two copies of the latter are issued to each naval vessel, one to be cut and the slips pasted in at the appropriate places, the other to be retained intact for reference.

To paste in the slips, as the Notices to Mariners are received, is one of the duties of the navigating officer, demanding faithful attention.

It must, however, be understood that Sailing Directions will rarely be correct in all details, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide, for which purpose, for ordinary navigation, it is sufficient.

The Tide Tables, which are published annually by the United States Coast and Geodetic Survey, give the predicted times and heights of the high and the low waters for every day in the year at 70 of the principal ports of the world, and, through the medium of these by means of tidal differences and ratios, at a very large number of subordinate ports. The tables for the Atlantic and the Pacific coast ports of the United States are also published separately.

It should be remembered that these tables aim to give the times of high and low water, and not the times of turning of the current or of slack water, which may be quite different.

Notices to Mariners, containing fresh information pertaining to all parts of the world, are published weekly and mailed to all

United States ships in commission, Branch Hydrographic offices and agencies, and United States consulates. Copies are furnished free by the main office or by any of the branch offices on application.

With each Notice to naval vessels is sent also a separate sheet, giving the items relating to lights contained in the latest Notice, intended especially for use in correcting the Light Lists.

Pilot Charts of the North Atlantic, Central American Waters, and North Pacific and Indian Oceans are published each month, and of the South Atlantic and South Pacific Oceans each quarter. These charts give the average conditions of wind and weather, barometer, percentage of fog and gales, routes for steam and sailing vessels for the period of issue, ice and derelicts for the preceding period, ocean currents and magnetic variation for the current year, storm tracks for preceding years, and much other useful information. They are furnished free only in exchange for marine data or observations.

Hydrographic Bulletins, published weekly, are supplemental to the Pilot Charts, and contain the latest reports of obstructions and dangers along the coast and principal ocean routes, ice, derelicts, and wreckage, reports of the use of oil to calm the sea, and other information for mariners. They are to be had free upon application.

THE USE OF CHARTS.

Accuracy of chart.—The value of a chart must manifestly depend upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become.

To judge of a survey, its source and date, which are generally given in the title, are a good guide. Besides the changes that may have taken place since the date of the survey, in waters where sand or mud prevails, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail; until a chart founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbors and their approaches, no surveys yet made have been so thorough as to make it certain that all dangers have been found. The number of the soundings is another method of estimating the completeness of the survey, remembering, however, that the chart is not expected to show all the soundings that were obtained. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Large or irregular blank spaces among soundings mean that no soundings were obtained in these spots. When the surrounding soundings are deep it may fairly be assumed that in the blanks the water is also deep; but when they are shallow, or it can be

seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch or pinnacle rock.

✓A wide berth should therefore be given to every rocky shore or patch, and instead of considering a coast to be clear, the contrary should be assumed.

Fathom curves a caution.—Except in charts of harbors that have been surveyed in detail, the 5-fathom curve on most charts may be considered as a danger line or caution against unnecessarily approaching the shore or bank within that line, on account of the possible existence of undiscovered inequalities of the bottom, which only an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for so detailed a survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

✓The 10-fathom curve on rocky shores is another warning, especially for ships of heavy draft.

A useful danger curve will be obtained by tracing out with a colored pencil, or ink, the line of depth next greater than the draft of the ship using the chart. For vessels drawing less than 18 feet the edge of the sanding serves as a well-marked danger line.

Charts on which no fathom curves are marked must especially be regarded with caution, as indicating that soundings were too scanty and the bottom too uneven to enable the curves to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed around, as it is doubtful how closely the spot may have been examined and whether the least depth has been found.

The chart on largest scale should always be used on account of its greater detail and the greater accuracy with which positions may be plotted on it.

Caution in using small-scale charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large-scale chart, whereas on one of small scale the same amount of displacement means a large fraction of a mile.

Distortion of printed charts.—The paper on which charts are printed from engraved plates has to be damped. On drying distortion takes place from the inequalities of the paper, which greatly

varies with different papers and the amount of the damping; but it does not affect navigation. The larger the chart the greater the amount of this distortion. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted on the chart, especially if the lines to objects be long.

Mercator chart.—Observed bearings are not identical with those measured on the Mercator chart (excepting only the bearings north and south, and east and west on the equator) because the line of sight, except as affected by refraction, is a straight line and lies in the plane of the great circle, while the straight line on the chart (except the meridian line) represents, not the arc of a great circle, but the loxodromic curve, or rhumb line, which on the globe is a spiral approaching but never in theory reaching the pole, or, if the direction be east and west, a circle of latitude.

The difference is not appreciable with near objects, and in ordinary navigation may be neglected. But in high latitudes, when the objects are very distant and especially when lying near east or west, the bearings must be corrected for the convergence of the meridians in order to be accurately placed on the Mercator chart, which represents the meridians as parallel.

On the polyconic chart, since a straight line represents (within the limits of 15 or 20 degrees of longitude) the arc of a great circle or the shortest distance between two points, bearings of the chart are identical with observed bearings.

The mercator projection is unsuited to surveying, for which purpose the polyconic projection is used by the Hydrographic Office and the Coast and Geodetic Survey.

Notes on charts should always be read with care, as they may give important information that can not be graphically represented.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact positions. They should therefore be regarded as warnings, and not as infallible navigational marks, especially when in exposed places and in the wintertime; and a ship's position should always, when possible, be checked by bearings or angles of fixed objects on shore.

Gas buoys.—The lights shown by gas buoys can not be implicitly relied on; the light may be altogether extinguished, or, if periodic, the apparatus may get out of order.

Whistle and bell buoys are sounded only by the action of the sea; therefore, in calm weather, they are less effective or may not sound.

Lights.—All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of 15 feet for the observer's eye. The effect of a greater or less height

of eye can be ascertained by means of the table of distances of visibility due to height, published in the Light Lists.

The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Refraction, too, may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light, the fact may be forgotten that aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be obtained from the standard compass when you lay down from aloft.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the ship is on the circle of visibility corresponding with the usual height of the eye, or unexpectedly nearer the light.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by its candlepower or order, as stated in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range corresponding to its height. Thus, a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the influence of the wind large areas of silence have been found in different directions and at different distances from the origin of sound, even in clear weather; therefore, too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly toward the land, and may not be observed by the lighthouse keepers until upon them; a ship may have been for many hours in it, and approaching the land in confidence, depending on the signal, which is not sounded. When sound travels against the wind, it may be thrown upward; a man aloft might then hear it though inaudible on deck.

The submarine bell system of fog signals is much more reliable than systems transmitting sound through the air, as sound traveling in water is not subject to the same disturbing influences; the fallibility of the lighthouse keeper is, however, about the same in all systems, so that caution should be observed even by vessels equipped with submarine-bell receiving apparatus.

Submarine bells have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus may determine the approximate bearing of the signal. These signals may be heard also on vessels not equipped with receiving apparatus by observers below the water line, but the bearing of the signal can not then be readily determined.

Vessels equipped with radio apparatus and submarine bell receivers may fix their distance from a light vessel having radio and submarine bell, utilizing the difference in velocity of sound waves of the radio and the bell. Sound travels 4,794 feet per second at 66° F. in water, and the travel of radio sound waves for practicable distances may be taken as instantaneous.

All vessels should observe the utmost caution in closing the land in fogs. The lead is the safest guide and should be faithfully used.

Tides.—A knowledge of the times of high and low water and of the amount of vertical rise and fall of the tide is of great importance in the case of vessels entering or leaving port, especially when the low water is less than or near their draft. Such knowledge is also useful at times to vessels running close along a coast, in enabling them to anticipate the effect of the tidal currents in setting them on or offshore. This is especially important in fog or thick weather.

The predicted times and heights of the high and low waters, or differences by which they may be readily obtained, are given in the Tide Tables for all the important ports of the world. The height at any intermediate time may be obtained by means of Tables 2A and 2B for most of the principal tidal stations of the United States, given in Table 1, and for the subordinate stations of Table 3 by using them as directed in the Tide Tables. The intermediate height may also be obtained by plotting the predicted times and heights of high and low water and connecting the points by a curve. Such knowledge is often useful in crossing a bar or shallow flats.

Planes of reference.¹—The plane of reference for soundings on Hydrographic Office charts made from United States Government surveys and on Coast and Geodetic Survey charts of the Atlantic coast of the United States is mean low water; on the Pacific coast of the United States as far as the Strait of Juan Fuca, it is the mean of the lower low waters; and from Puget Sound to Alaska, the plane employed on Hydrographic Office charts is low water ordinary springs.

On most of the British Admiralty charts the plane of reference is the low water of ordinary springs; on French charts, the low water of equinoctial springs.

¹ The distinction between "rise" and "range" of the tide should be understood. The former expression refers to the height attained above the datum plane for soundings, differing with the different planes of reference; the latter, to the difference of level between successive high and low waters.

In the case of many charts compiled from old or various sources the plane of reference may be in doubt. In such cases, or when ever not stated on the chart, the assumption that the reference plane is low water ordinary springs gives a larger margin of safety than mean low water.

Whichever plane of reference may be used for a chart it must be remembered that there are times when the tide falls below it. Low water is lower than mean low water about half the time, and when a new or full moon occurs at perigee the low water is lower than the average low water of springs. At the equinoxes the spring range is also increased on the coasts of Europe, but in some other parts of the world, and especially in the Tropics, such periodic low tides may coincide more frequently with the solstices.

Wind or a high barometer may at times cause the water to fall below even a very low plane of reference.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can not be depended upon and additional caution is necessary.

Mean sea level.—The important fact should be remembered that the depths at half tide are practically the same for all tides, whether neaps or springs. Half tide therefore corresponds with mean sea level. This makes a very exact plane of reference, easily found, to which it would be well to refer all high and low waters.

The Tide Tables give in Table 3, for all the ports, the plane of reference to which tidal heights are referred and its distance below mean sea level.

If called on to take special soundings for the chart at a place where there is no tidal bench mark, mean sea level should be found and the plane for reductions established at the proper distance below it, as ascertained by the Tide Tables, or by observations, or in some cases, if the time be short, by estimation, the data used being made a part of the record.

Tidal streams.—In navigating coasts where the tidal range is considerable, especial caution is necessary. It should be remembered that there are indrafts to all bays and bights, although the general run of the stream may be parallel with the shore.

The turn of the tidal stream offshore is seldom coincident with the times of high and low water on the shore. In some channels the tidal stream may overrun the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

The effect of the tidal wave in causing currents may be illustrated by two simple cases.

(1) Where there is a small tidal basin connected with the sea by a large opening.

(2) Where there is a large tidal basin connected with the sea by a small opening.

In the first case the velocity of the current in the opening will have its maximum value when the height of the tide within is changing most rapidly, i. e., at a time about midway between high and low water. The water in the basin keeps at approximately the same level as the water outside. The flood stream corresponds with the rising and the ebb with the falling of the tide.

In the second case the velocity of the current in the opening will have its maximum value when it is high water or low water without, for then there is the greatest head of water for producing motion. The flood stream begins about three hours after low water, and the ebb stream about three hours after high water, slack water thus occurring about midway between the tides.

Along most shores not much affected by bays, tidal rivers, etc., the current usually turns soon after high water and low water.

The swiftest current in straight portions of tidal rivers is usually in the middle of the stream, but in curved portions the most rapid current is toward the outer edge of the curve, and here the water will be deepest. The pilot rule for best water is to follow the ebb tide reaches.

Countercurrents and eddies may occur near the shores of straits, especially in bights and near points. A knowledge of them is useful in order that they may be taken advantage of or avoided.

A swift current often occurs in a narrow passage connecting two large bodies of water, owing to their considerable difference of level at the same instant. The several passages between Vineyard Sound and Buzzards Bay are cases in point. In the Woods Hole passage the maximum strength of the tidal streams is at about half tide.

Tide rips are made by a rapid current setting over an irregular bottom, as at the edges of banks where the change of depth is considerable.

Current arrows on charts show only the most usual or the mean direction of a tidal stream or current; it must not be assumed that the direction of a stream will not vary from that indicated by the arrow. The rate, also, of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

FIXING POSITION.

Sextant method.—The most accurate method available to the navigator of fixing a position relative to the shore is by plotting with a protractor, sextant angles between three well-defined objects on

shore which are shown on the chart; this method, based on the "three-point problem" of geometry, should be in general use.

For its successful employment it is necessary: First, that the objects be well chosen; and, second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice. Two observers are better for this method.

Near objects should be used either for bearings or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in misplacing the position the longer the line to be drawn.

On the other hand distant objects should be used for direction, because less affected by a small error or change of position.

The three-arm protractor or station pointer consists of a graduated brass circle with one fixed and two movable radial arms, the three beveled edges of the arms, if produced, intersecting at the exact center of the instrument. The edge of the fixed arm marks the zero of the graduation which enables the movable arms to be set at any angles with the fixed arm.

To plot a position, the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole.

The transparent xylonite protractor is an excellent substitute for the brass instrument and in some cases preferable to it, as when, for instance, the objects angled on are so near the observer that they are more or less hidden by the circle of the instrument. The xylonite protractor also permits the laying down for simultaneous trial of a number of angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through three objects (in which case the sum of the observed angles equals the supplement of the angle at the middle object made by lines from the other two) it will be indeterminate, as it will plot all around the circle. Such an observation is called a "revolver." An approach to this condition must be avoided. Near objects are better than distant ones, and, in general, up to 90° the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for

navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation.

A single angle and a range of two objects give in general an excellent fix, easily obtained and plotted. ~

Advantages of sextant method.—In many narrow waters where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by its means. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might under such circumstances put the ship ashore.

✓ In all cases where great accuracy of position is desired, such as the fixing of a rock or shoal, or of fresh soundings or new buildings as additions to the chart, the sextant should invariably be used. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. If a round of angles can be taken the observer's accuracy is also checked. In the case of ordinary soundings a third angle need be taken only occasionally; first, to check the general accuracy of the chart, as above stated; second, to make certain that the more important soundings, as at the end of a line, are correctly placed.

If communication can be had with the shore, positions may be fixed with great accuracy by occupying with theodolite or sextant two known points of the chart. The third angle of the triangle, that between the two points at the position sought, should be measured as a check.

The compass.—It is not intended that the use of the compass to fix the ship should be given up; in ordinary piloting the compass, with its companion, the pelorus, may be usefully employed for this purpose, although less accurate than the sextant.

If the accuracy of the chart is doubtful, the compass should be used in preference to the sextant.

In fixing by the compass, it should always be remembered that a position by two bearings only, like that by two angles only, is liable to error. An error may be made in taking a bearing, or in applying to it the deviation, or in laying it on the chart. A third or check bearing should, therefore, be taken of some other object, especially when near the shore or dangers. A common intersection for the three lines assures accuracy.

When the three lines do not intersect in a point, the following rule holds: If the line drawn to the middle object falls to the right of the point of intersection of the lines to the two outside objects, the position of the observer was to the right of the line to the middle object; and if it falls to the left of the intersection his position was to the left of the line. Thus it will be seen that the assumption, that the position is at the center of the triangle formed by the intersecting lines, is incorrect.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "bow and beam bearing," the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy, and is an excellent fix for a departure, but does not insure safety, as the object observed and any dangers off it are abeam before the position is obtained.

By taking the bearings at two points and four points on the bow, a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current. Taking afterwards the beam bearing gives, with slight additional trouble, the distance of the object when abeam; such beam bearings and distances, with the times, should be continuously recorded as fresh departures, the importance of which will be appreciated in cases of being suddenly shut in by fog.

When the first bearing is $26\frac{1}{2}^{\circ}$ from ahead, and the second 45° , the run between bearings will equal the distance at which the object will be passed abeam.

A table of multipliers of the distance run in the interval between any two bearings of an object, the product being its distance at the time of the second bearing, is given in the Light Lists and in Bowditch.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten. In employing the horizontal danger angle, however, caution is necessary, as should the chart be inaccurate, i. e., should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

The vertical danger angle may be conveniently used when passing elevated points of known heights, such as lighthouses, cliffs, etc. The computation of the distance corresponding to the height of the object and its angular elevation requires for small distances merely the solution of a plain right triangle; the natural cotangent of the angle multiplied by the height in feet gives the distance in

feet. The convenient use of this method, however, requires tables such as those published by Capt. Lecky in his little book entitled "The Danger Angle and Offshore Distance Tables." This book very usefully extends the vertical angle method to finding a ship's position at sea by observing the angular altitude of a peak of known height and its bearing. The tables give heights up to 18,000 feet and distances up to 110 miles.

When the angles are not too large they should be observed "on and off the limb" and the index error of the sextant thus eliminated, in preference to correcting for it the single altitude. It must be remembered that in high latitudes the bearing of a distant object needs correction for the convergence of the meridians before being laid down on a Mercator chart. The correction may be found by the following formula, using the approximate position: The sine of the correction equals the product of the sine of half the difference of longitude by the sine of the middle latitude. It is applied on the equatorial side of the observed bearing and its effect is always to increase the latitude of the observer.

Soundings taken at random are of little value in fixing or checking position and may at times be misleading. In thick weather, when near or closing the land, soundings should be taken continuously and at regular intervals, and, with the character of the bottom, systematically recorded. By laying the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship, and then moving the paper over the chart, keeping the line representing the track parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined. This plan was suggested by Lord Kelvin, whose admirable sounding machine renders the operation of sounding possible in quite deep water, without slowing down the ship and consequent loss of time.

Pelorus.—All ships should be supplied with the means of taking accurate bearings both by night and by day. The standard compass is not always conveniently placed for the purpose; in such case a pelorus will be very useful, but the results are not as accurate as those obtained direct from the compass. The utility of such an instrument in ascertaining the change of bearing of an approaching ship should not be overlooked.

Position lines.—Among the various methods of fixing position at sea, the one which should be best understood and put to the most constant use is that employing position or Sumner lines. These lines give the most comprehensive information to the navigator with the least expenditure of labor and time. The knowledge gained is that the vessel must be somewhere on the line, provided the data used is accurate and the chronometer correct. As the information

given by one line of position is not sufficient to determine the definite location of the vessel, it is necessary to cross this line by another similarly obtained, and the vessel being somewhere on both must be at their intersection. However, a single line, at times, will furnish the mariner with invaluable information; for instance, if it is directed toward the coast, it marks the bearing of a definite point on the shore, or if parallel to the coast it clearly indicates the distance off, and so will often be found useful as a course. A sounding taken at the same time with the observation will in certain conditions prove of great value in giving an approximate position on the line.

The easiest and quickest way to establish a line of position is by employing the method of Marcq St. Hilaire, as modified by the use of tables of altitude. The principle of this method is one of altitude differences, in which the observed altitude is compared with the computed altitude for a dead reckoning, or other selected position, and the difference in minutes of latitude measured toward the body along the line of its azimuth, if the observed altitude is greater than the computed altitude, and vice versa. A line drawn at right angles to the line of azimuth through the point thus determined is the position line, somewhere upon which will be found the position of the vessel. The tables of altitude obviate the computation of the altitude and thereby greatly facilitate the establishment of the line.

A position line may also be found by computing two positions for longitude with two assumed latitudes, and drawing the line between them; or by drawing to the position obtained with one latitude a line at right angles to the bearing of the body as taken from the azimuth tables.

A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The position lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day and in combination with the sun gives an excellent fix.

The morning and evening twilight observations, besides their great accuracy, possess the additional advantage of greatly extending the ship's reliable reckoning beyond the limits of the ordinary day navigation, and correspondingly restricting the dead reckoning uncertainties of the night. An early morning fix in particular is often of great value. Though the same degree of

accuracy as at twilight can not be expected, night observations are very valuable and should be assiduously practiced.

Piloting.—The navigator, in making his plan for entering a strange port, should give very careful previous study to the chart and sailing directions, and should select what appear to be the most suitable marks for use, also providing himself with substitutes to use in case those selected as most suitable should prove unreliable in not being recognized with absolute certainty. Channel buoys seen from a distance are difficult to identify, because their color is sometimes not easily distinguished and they may appear equally distant from the observer even though they be at widely varying distances. Ranges should be noted, if possible, and the lines drawn, both for leading through the best water in channels, and also for guarding against particular dangers; for the latter purpose safety bearings should in all cases be laid down where no suitable ranges appear to offer. The courses to be steered in entering should also be laid down and distances marked thereon. If intending to use the sextant and danger angle in passing dangers, and especially in passing between dangers, the danger circles should be plotted and regular courses planned, rather than to run haphazard by the indications of the angle alone, with the possible trouble from bad steering at critical points.

The ship's position should not be allowed to be in doubt at any time, even in entering ports considered safe and easy of access, and should be constantly checked, continuing to use for this purpose those marks concerning which there can be no doubt until others are unmistakably identified.

The ship should ordinarily steer exact courses and follow an exact line, as planned from the chart, changing course at precise points, and, where the distances are considerable, her position on the line should be checked at frequent intervals. This is desirable even where it may seem unnecessary for safety, because if running by the eye alone and the ship's exact position be immediately required, as in a sudden fog or squall, fixing at that particular moment may be attended with difficulty.

The habit of running exact courses with precise changes of course will be found most useful when it is desired to enter port or pass through inclosed waters during fog by means of the buoys; here safety demands that the buoys be made successively, to do which requires, if the fog be dense, very accurate courses and careful attention to the times, the speed of the ship, and the set of the current; failure to make a buoy as expected leaves, as a rule, no safe alternative but to anchor at once, with perhaps a consequent serious loss of time.

In passing between dangers where there are no suitable leading marks, as, for instance, between two islands or an island and the main shore, with dangers extending from both, a mid-channel course may be steered by the eye alone with great accuracy, as the eye is able to estimate very closely the direction midway between visible objects.

In piloting among coral reefs or banks, a time should be chosen when the sun will be astern, conning the vessel from aloft or from an elevated position forward. The line of demarcation between the deep water and the edges of the shoals, which generally show as green patches, is indicated with surprising clearness. This method is of frequent application in the numerous passages of the Florida Keys.

Changes of course should in general be made by exact amounts, naming the new course or the amount of the change desired, rather than by ordering the helm to be put over and then steadying when on the desired heading, with the possibility of the attention being diverted and so of forgetting in the meantime, as may happen, that the ship is still swinging. The helmsman, knowing just what is desired and the amount of the change to be made, is thus enabled to act more intelligently and to avoid bad steering, which in narrow channels is a very positive source of danger.

Coast piloting involves the same principles and requires that the ship's position be continuously determined or checked as the landmarks are passed. On well-surveyed coasts there is a great advantage in keeping near the land, thus holding on to the marks and the soundings, and thereby knowing at all times the position, rather than keeping offshore and losing the marks, with the necessity of again making the land from vague positions, and perhaps the added inconvenience of fog or bad weather, involving a serious loss of time and fuel.

The route should be planned for normal conditions of weather, with suitable variations where necessary in case of fog or bad weather or making points at night, the courses and distances, in case of regular runs over the same route, being entered in a notebook for ready reference, as well as laid down on the chart. The danger circles for either the horizontal or the vertical danger angles should be plotted, wherever the method can be usefully employed, and the angles marked thereon; many a mile may thus be saved in rounding dangerous points with no sacrifice in safety. Ranges should also be marked in, where useful for position or for safety, and also to use in checking the deviation of the compass by comparing, in crossing, the compass bearing of the range with its magnetic bearing, as given by the chart.

Changes of course will in general be made with mark or object abeam, the position (a new "departure") being then, as a rule, best and most easily obtained. The pelorus should be at all times in readiness for use, and the chart where it may be readily consulted by the officer of the watch. The sextant should also be kept conveniently at hand.

A continuous record of the progress of the ship should be kept by the officer of the watch, the time and patent-log reading of all changes of course and of all bearings, especially the two and four point bearings, with distance of object when abeam, being noted in a book kept in the pilot house for this especial purpose. The ship's reckoning is thus continuously cared for as a matter of routine and without the presence or particular order of the captain or navigating officer. The value of thus keeping the reckoning always fresh and exact will be especially appreciated in cases of sudden fog or when making points at night.

Where the coastwise trip must be made against a strong head wind, it is desirable, with trustworthy charts, to skirt the shore as closely as possible in order to avoid the heavier seas and adverse current that prevail farther out. In some cases, with small ships, a passage can be made only in this way. The important saving of coal and of time, which is even more precious, thus effected by skillful coast piloting makes this subject one of prime importance to the navigator.

Change in the variation of the compass.¹—The gradual change in the variation must not be forgotten in laying down on the chart courses and bearings. The magnetic compasses placed on the charts for the purpose of facilitating the plotting become in time slightly in error, and in some cases, such as with small scales or when the lines are long, the displacement of position from neglect of this change may be of importance. The date of the variation and the annual change, as given on the compass rose, facilitate corrections when the change has been considerable. The compasses are reengraved once in ten years; more frequent alterations on one spot in a copperplate would not be practicable.

The change in the variation is in some parts of the world so rapid as to need careful consideration, requiring a frequent change of the course. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles.

Local magnetic disturbance of the compass on board ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the

¹ See H. O. Chart No. 2406, Variation of the Compass.

ship. Observation shows that disturbance of the compass in a ship afloat is experienced in only a few places on the globe.

Magnetic laws do not permit of the supposition that the visible land causes such disturbance, because the effect of a magnetic force diminishes so rapidly with distance that it would require a local center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong, the compass may be temporarily deflected when passing over such a spot; but the area of disturbance will be small unless there are many centers near together.

Use of oil for modifying the effect of breaking waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skillfully applied, may prevent much damage both to ships, especially of the smaller classes, and to boats by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:

1. On free waves, i. e., waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when no other oil is obtainable, or it may be mixed with other oils; all animal and vegetable oils, such as waste oil from the engines, have great effect.
4. In cold water, the oil, being thickened by the low temperature and not being able to spread freely, will have its effect much reduced, a rapid-spreading oil should be used.
5. A small quantity of oil suffices, if applied in such a manner as to spread to windward.
6. It is useful in a ship or boat either when running, or lying-to, or in wearing.
7. When lowering and hoisting boats in a heavy sea the use of oil has been found greatly to facilitate the operation.
8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to permit leakage. The waste pipes forward are also very useful for this purpose.

9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan.

On a bar, with the ebb tide running, it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside, bearing in mind that her natural tendency is always to forge ahead. If she is aground the effect of oil will depend upon attending circumstances.

11. For a boat riding in bad weather to a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat, and the bag readily hauled on board for refilling, if necessary.

CHAPTER I.

GENERAL DESCRIPTION; BOUNDARIES; SWEDEN; NORTH GERMANY; RUSSIA; KAISER WILHELM CANAL; NAVIGABLE SEASON; PILOTS; COAL; UNIFORM SYSTEM OF BUOYAGE; WINTER MARKS; FOG SIGNALS; WINDS AND WEATHER; STORM SIGNALS; TIDES; RANGE OF WATER LEVEL; SIGNALS OF NAVIGABLE DEPTHS; CURRENTS; ICE; SIGNAL STATIONS; TELEGRAPH CABLES; COMMUNICATION; WEIGHTS AND MEASURES; AND MONEY.

The Baltic, the name by which this inland sea is commonly designated, and the derivation of which is uncertain, is known to the Swedes as the "Östersjö," to the Danes as the "østersø," and to the Germans as the "Ostsee" or East Sea.

The Baltic is about 710 miles in length from the Danziger bucht, in a northerly direction, to the head of the Gulf of Bothnia, and it communicates with the North Sea, by three channels, between the Scandinavian Peninsula and the northern peninsula of Schleswig and Jutland; these channels are named the Great Belt, Little Belt, and the Sound; the navigable depth in each of which is given elsewhere, but the Sound is not available for the largest ships. The Baltic can also be reached by a ship canal. The northern part of this inland sea divides into two branches, namely, the Gulf of Bothnia, extending 360 miles in a northerly, and the Gulf of Finland 240 miles in an easterly direction. The western shore is formed by Sweden. The southern and eastern shores are formed by the coasts of Germany (Prussia) and Russia, and the east shore of the Gulf of Bothnia by the coast of Finland.

The Gulf of Bothnia is much restricted at its southern end by the Åland Archipelago.

The shore of the Baltic is generally low, along the southern shore it is for the most part sandy; sandbanks offshore, and sandhills and plains inland. Where streams come down, there are fresh-water lakes, termed "haffs," separated from the sea by narrow spits termed "nehrungs." Near the entrance to the Gulf of Finland the shore becomes rocky and for the most part continues so around the Gulfs of Finland and Bothnia except toward the heads of each; the rocks, however, are not high (rarely over 50 feet), and are called by the

Swedes "Skär" (pronounced "Share"). A large rocky archipelago fronts the approaches to Stockholm, known generally as Stockholm Skärgård. The coast of the southern part of the Swedish Peninsula is moderately high, but not rocky.

The depth of the Baltic rarely exceeds 100 fathoms; the places where a greater depth is found lie eastward and northward of Gotland Island; the deepest sounding charted is that of 240 fathoms, clay, 17 miles eastward of Landsort, in latitude $58^{\circ} 42'$ north, longitude $18^{\circ} 23'$ east.

When ice forms over the shallow grounds which border the shores large blocks of stone are lifted and transported considerable distances; these, when accumulated, sometimes form formidable dangers to navigation, the more so that they are quite unknown to seamen, until perhaps a disaster occurs. This applies mainly to the various "Skärgårdleden" or channels between the fringe of rocky islets fronting the shore in many parts of the Baltic.

As touching upon the matter of ships' "freeboard marks" it may be here mentioned that the water in the Baltic is much less salt than the North Sea, especially at the heads of the Gulfs of Bothnia and Finland, where it is quite fresh and drinkable in summer when the great rivers are flowing into them, while in winter, when the rivers are frozen, the water is sensibly brackish. The water is also fresher on the surface than at depths below it, thus, the proportion of salt in 1,000 parts of surface water taken near Stockholm being 5.919, while bottom water from 120 fathoms was 7.182; in like manner the proportion of salt in the surface water at the entrance to the Gulf of Finland being 3.552, that from 30 fathoms below the surface was 4.921, the proportion of salt in the North Sea averaging about 26 parts in 1,000.

Boundaries.—The boundary between Sweden and Russian Finland is the Torne Elf (Torneo River) at the head of the Gulf of Bothnia.

The islands Gotland and Öland belong to Sweden; Dagö and Ösel to Russia. Bornholm is a possession of Denmark.

The boundary between Russia and Germany (Prussia) on the Baltic shore is about 10 miles northward of Memel.

Sweden is about 1,020 miles in length, between 100 and 200 miles in breadth, and has an area of about 172,874 square miles; and with an estimated population on December 31, 1913, of 5,638,583, mostly Lutherans. It is divided into three principal parts; Gotland comprises the southern Provinces, and consists of sandy plains, interspersed with numerous lakes and hills; Sweden proper includes the central Provinces, and contains extensive plains with large tracts of forests; and Norrland comprises Gefle and all the Provinces northward of Torneå. A curious feature of the lowlands of Scandinavia

is observed in the gravel ridges, termed "åsars," which extend generally in a north-northwest and south-southeast direction.

The east coast of Sweden, between the parallels of 56° and 66° north, is fronted by innumerable islands, rocks, and shoals; among these there are channels which lead to several good anchorages, but navigable only by those locally acquainted.

Lakes and rivers.—The southern and central parts of Sweden abound in fresh-water lakes, the largest of which are the Wener, Wetter, and Mälär. Stockholm and Göteborg are connected by canals, which unite these lakes. In the central and northern parts of Sweden there are several considerable rivers; the most important are the Indal, Ångerman, Ume, Piteå, Luleå, and Torne. All these rivers flow from the mountains and in their course form numerous grand cataracts.

Geology.—Granite and gneiss are the prevailing rocks in Sweden; mica slate is also very common, and alternates in certain places with vast beds of primitive limestone, quartz, and marble; the transition consists of conglomerate, sandstone, porphyry, limestone, and trap; the secondary of sandstone and chalk. Extensive tertiary and alluvial deposits also occur.

Mineralogy.—The mines in Sweden are a considerable source of national wealth, particularly the iron mines, of which the most important are Dannemora, in Upland; Persberg, in Wermland; Taberg, in Småland; and in the north, Gellivara, a mountain of rich ore, and Kirunavara-Luoss. Ätvidaberg, in East Gotland, and Falun, in Delecarlia, are celebrated for their copper mines. Silver is obtained at Sala, in Vestmanland. Other sources of mineral wealth are lead, nickel, cobalt, oxide of manganese, coal, sulphur, red ochre, vitriol, and plumbago.

Forests.—Fir and pine are the prevailing trees in the Swedish forests; in the north, birch grows in great abundance; in the center, the fir and pine are intermixed with ash, willow, lime, and maple, and in the south with oak, beech, and yoke elm (hornbeam). Timber is largely exported from the Swedish ports in the Baltic.

Climate.—From the extent of the country the climate varies considerably. In the north the surface of the country is covered with snow and ice for six months in the year, and even in the central and southern parts the lakes and rivers are frozen as late as April. The summers are hot and rapidly succeed the winters, which are dry, but very severe.

The annual amount of rain and snowfall is greatest at Borås, eastward of Göteborg, where it is 35.08 inches, at Kalmar it is 14.66 inches, and at Karesuando, in northern Lapland, we have the lowest rainfall of the whole country, or 12.32 inches.

At Stockholm the average temperature is 26.1° in February and 62.4 in July, and at Haparanda 10° in January and 59° in July.

Agriculture.—Sweden is an agricultural and pastoral country, and exports considerable quantities of corn and cattle. The soil in many districts is, however, light, poor, and thin; between one-eighth and one-ninth of the surface of the country is under tillage and pasturage; the rest is forest, rocks, and waste land. Horses and cattle are extensively reared, and improvements of race promoted by public establishments for breeding.

Commerce.—The foreign trade is chiefly confined to exports of iron, steel, timber, wood pulp, iron and zinc ores, tools, stone, paper, grain, matches, butter, eggs, etc., and to imports of coal, coffee, wine, spirits, oil, oil cake, salt, hides, grain, bran, cotton, linseed, manures, tools, iron, etc.

Foreign vessels of war in Swedish waters—Regulations concerning entry and pilotage.—The following regulations, applicable to this book, are taken from a royal decree issued on December 20, 1912:

Foreign warships are not, without special permission, allowed to enter the Swedish war harbors of Stockholm, Karlskrona, and Fårö Sund; the proper military authorities in those harbors may, even if permission is not obtained beforehand, allow a ship to enter for the purpose of fishery inspection or scientific work.

Furthermore, as according to a separate royal decree, entry to certain districts in Swedish territorial waters is forbidden to a belligerent power's ships, so those certain districts shall be regarded as war harbors, and entry thereto by foreign ships of war is forbidden.

Foreign warships may enter other Swedish ports and roadsteads on condition that not more than three such vessels of the same nationality anchor simultaneously in the same port or roadstead, and that their stay does not, without special authority, exceed 14 days; and they shall announce the visit through the diplomatic channel at least eight days before, if possible.

2. The different war-harbor districts consist of:

For Stockholm: The zone within a line drawn from the mainland at S. Rorvik, west of the Simpnäsklubb Light, going through the Simpnäsklubb Light, Söderarm Light, Grönskär Light, Hufvudskär Light, Röko Light, over the southern point of Yxelö to the mainland, and the zone within a line drawn from the southern point of Järflotta, through Landsort to Ledsjär.

For Karlskrona: The zone within a line drawn from Torhamn-sudde through Utlängan Light to Giö (Gjö) Point on the mainland.

For Fårö Sund: The zone within a line at the northern entrance, from the point at Hallegrund, through the northern point of Falholmen to the coast of Gotland at Halludden west of the said island, and

the zone within a line drawn from the southern entrance from Ryssnäs along Bungeör's eastern shore to the northeastern point of Skenholmen and on to the Gotland coast at Albyref, west of Skenholmen.

3. If in consequence of diplomatic negotiations or other reasons permission has been granted to foreign warships to visit a Swedish war harbor or similar zone, the vessels must choose their anchorage in conformity with the regulations issued by the local military authorities.

4. In the event of the King so ordering it, foreign ships of war are obliged to leave the port or territorial waters and to put to sea within six hours after the order shall have been transmitted by the local military or civil authorities, even if the time granted for the stay, in accordance with paragraph 1, shall not have elapsed.

5. The personnel of a foreign man of war may not undertake nautical surveys or soundings of Swedish territorial waters except such soundings as are necessary for the safety and navigation of the ship.

Landing and shooting practice may not be carried out, nor may an armed force be landed without special permission.

6. Foreign men of war in inner Swedish territorial waters may not take any other course than the Government pilot's fairway, and the commander of the vessel, unless otherwise authorized, is obliged to employ competent Swedish pilots. By inner Swedish territorial waters is here understood to mean harbors, entrance to harbors, roadsteads, and creeks, as also waters surrounding islands, rocks, and reefs which are uncovered at low water.

The commander of a foreign man-of-war is obliged, when in Swedish territorial waters, to conform to the provisions of the sanitary, pilot, customs, port, and police regulations, of which he is informed by the proper authorities.

7. The regulations contained in paragraph 1 are not in force as regards vessels on which is a Head of a State or his official representative, for vessels escorting the same, or for ships in great distress.

8. Special regulations are in force for belligerents' ships of war entering Swedish harbors, roadsteads, or other Swedish territorial waters.

North Germany.—**Prussia** lies for the most part in the northern lowland of Germany and embraces two-thirds of the entire area of the empire.

Rügen, the largest island belonging to Germany dealt with in this work, is situated on the south side of the entrance to the Baltic, and is separated from the mainland of Pomerania by the narrow Stralsund Channel. The east coast of Rügen presents some romantic scenery; the other parts of the island, with the exception of Arkona.

are mostly flat and uninteresting. Bergen, near the center of the island, is the chief town. On the north side of the town lies Rugard, the highest hill in Rügen; on the summit of this hill are the ruins of an ancient fortress, destroyed in 1316. During the summer Rügen is frequented by visitors from all parts of northern Germany for sea bathing.

Rivers.—The principal rivers on the German shores of the Baltic are the Oder, Vistula, Pregel, and Niemen.

Climate and productions.—The climate of Prussia is pleasant in the west, but extreme in the east. In the middle of the country the summer is as warm as in the west of France, but in winter as cold as in the southwest of Norway.

Much of the soil is fertile, especially along the Lower Rhine and Vistula; but much is sandy, and about one-fifth is covered with wood. The chief crops are rye, wheat, oats, and potatoes; the vine is grown in the Rhine Valley, tobacco in the middle portion, and flax in the northeast.

The chief manufactures are linen, woolen, and cotton in the west, and articles of iron and steel. Amber, a kind of fossil resin, is found on the Baltic coast of Germany, chiefly on the Nehrung of the Frische Haff. North Germany is noted for its good horses and cattle and the central districts of the northern lowland for sheep.

Caution when approaching German coasts and harbors.—(Applicable before the beginning of the present war.)—The German Government has given notice that under certain circumstances, such as manœuvres, ordinary exercises, or for other causes, it may be necessary to prohibit free entrance into or departure from German harbors and river mouths by night.

To indicate that entrance to a harbor is closed, or that obstructions exist therein, three red balls by day and three red lights by night, placed vertically one above the other, will be shown in a conspicuous position near the approach to the harbor.

Vessels must then approach the harbor with the greatest caution. At night it is advisable, when possible, to anchor until daybreak outside the prohibited area.

The same course should be pursued if searchlights are at work, or signals given, the meaning of which is not recognizable from the Sailing Directions or Light Lists.

All merchants vessels desirous then to enter or leave these privileged harbors must, as soon as they observe the three red balls or three red lanterns, fly the pilot signal and await the arrival of the watch vessel, and must submit to examination if required.

The establishment of an examination service will not be notified publicly, but, as far as possible, the requisite reports and directions will be given to approaching vessels by patrol ships, which will also carry the above-mentioned signals, viz, three red balls by day and

three red lights by night, and also, under certain circumstances, the pilot flag.

The examination commission (and pilots) are on board the patrol ships. It is in the real interest of masters of vessels to comply with all directions received from them.

Under all circumstances vessels are prohibited from passing the line of patrol ships without communicating with them.

On a gun being fired or signal made from a patrol ship, all merchant vessels must stop immediately.

The watch or pilot vessel will give detailed information as to examination service, length of time the harbor entrance is closed, or any special regulations for navigation that are in force.

Anyone neglecting these regulations is answerable for damage occasioned and acts at his own risk.

Information for departing vessels is given by the harbor authorities.

Instructions for foreign war vessels in German harbors.—(Prior to the present war.)—The German Government has given notice that—

(1) War vessels of foreign powers need no special permission to enter fortified and unfortified German harbors and river mouths or to navigate on inland waters. Suitable notice should, however, be given of such visits through diplomatic channels.

Without this, foreign war vessels, with the exception of the cases given in article 2, may neither cross the extreme line of fortification nor remain in the roadstead nor in the harbor, respectively, in river mouths and inland waters. For use of the Kaiser Wilhelm Canal, see article 3.

The number of war vessels of the same foreign nation allowed to remain at the same time in a fortified or unfortified harbor is limited to three. Exceptions require permission, obtained through diplomatic channels.

(2) The above regulations do not apply (a) to vessel having on board sovereigns, members of the sovereign's family, Presidents of Republics or their suite, or ambassadors or envoys to the Court of His Imperial Majesty the Emperor; (b) to vessels which are obliged by perils of the sea or damage to run into a German harbor, etc.

(3) Permission should previously be applied for through diplomatic channels for foreign war vessels to pass through the Kaiser Wilhelm Canal.

(4) In harbors which are not headquarters of the commander in chief of a station the chief pilot (Lotsenkommandeur) shall, without delay, give notice of the approach of a foreign warship to the commandant, etc. In Neufahrwasser the chief pilot shall inform the naval officer in charge of the Imperial dockyard, Danzig, in addition to the commandant.

(5) The right of assigning anchoring billets for foreign warships, and ordering them to move, is solely vested in the commander in chief of naval stations, or the commandant, who is to keep in communication with the customs officials, so that he may arrange, in the interests of the latter, the anchoring billets.

(6) The pilots at fortified ports are to be supplied with instructions as to whether any, and if so which and how many, foreign warships, etc., may enter without previous permission, or whether such must be obtained, and where the vessels are to anchor. In so far as the interests of the sea or harbor police are concerned, the commandant, etc., is to obtain and consider the opinion of the chief pilot or harbor master as far as possible. Vessels of foreign powers are under no obligation to take a pilot when approaching the roadstead or anchorage; but within the boundaries of a fortified German port they are subject to the police regulations.

(7) Should the harbor police regulations be disregarded by a foreign warship, the captain of the ship is to have his attention drawn thereto, and the explicit observance of these regulations insisted on. Should this fail and delay become dangerous, the competent authority shall take steps according to his own judgment; in other cases, however, the directions of the superior authority are to be sought.

(8) When a foreign warship, or squadron, crosses the fortress boundaries from seaward, an officer is to be sent by the commander in chief of the station or the commandant to greet it. Should the place not belong to the imperial navy ports, this officer is to be accompanied by the chief pilot or harbor master.

(9) This officer is to give the captain of the ship or squadron official notification as to whether the same may enter, and how long they may remain in the roadstead or harbor. When desirable, the officer, the chief pilot accompanying him, or the harbor master, is to assign the ship an anchoring billet, and acquaint the captain with the harbor-police regulations.

(10) Should a foreign warship or vessel, as an exception, cross the fortress limits from seaward at nighttime, the welcoming officer is only to be sent the following day. In such case the ship may anchor at pleasure, or, if it has taken a pilot, according to his directions; but it is bound to change its anchorage if requested to do so by the station commander in chief or commandant, etc.

Additional lights and signals exhibited by German vessels towing targets; lights shown from targets.—The undermentioned regulations are in force with regard to the lights and signals to be exhibited by German vessels when towing targets, and the lights to be shown from the targets:

(a) The tug.—A vessel having targets in tow shall, so far as her size and rig will allow, show the following signals—

By night.—In addition to the lights prescribed by article 3 of the Regulations for Preventing Collisions at Sea, three lights in a vertical line one over the other, visible all around the horizon; the two upper to be red and the lowest white. Should a vessel approach the towing train in such a manner as to threaten collision, a blue light will be shown from the tug.

By day.—Two black cones, point down. The above signals indicate that the vessel showing them is towing one or several targets, which may be as much as 1 mile astern of her; also that the tug is obstructed more or less in her ability to maneuver.

(b) Targets in tow.—At night, when gun practice is not being carried out at towed targets and circumstances will permit of it, a white light, visible all around the horizon, will be shown from the end of the last target.

If gun practice is taking place, or about to take place, this light will not, as a rule, be displayed.

The exhibition of a light from the target can not therefore be relied on.

(c) Targets at anchor.—Every target at anchor shall exhibit a white light visible around the horizon.

Caution.—When approaching a vessel which is firing, special caution is required. By night the direction of the rays of the searchlights will afford an indication of the direction of fire and the position of the targets.

Gunnery, torpedo, and submarine mining practice occasionally occurs at German ports, during which warning signals are made from the shore, the details of which, where known, are inserted under the various ports. At the same time a pilot steamer is stationed in the offing to caution approaching vessels. The ports described in this book at which it is known that practice occurs periodically are Swinemünde, Neufahrwasser, and Pillau.

Signals with regard to German submarine vessels.—When submarine vessels are exercising submerged the vessel escorting them will display two red flags, one above the other, at least 3 feet apart.

All vessels seeing this signal should keep a specially good lookout for submarines emerging, but should otherwise keep their course or alter course only as required for navigation.

On sighting a submarine coming to the surface, it should be remembered that she may not possess maneuvering capacity, or be able to make the prescribed signal for alteration of course; vessels must, therefor, under these circumstances, proceed with special care in order to avoid danger of collision.

When meeting submarines navigating on the surface, the usual rule of the road should be observed.

Russia.—Three Baltic Provinces are Kourland, Livonia, and Esthonia.

Productions.—Russia is a most important grain-producing country; large quantities of flax and hemp are produced in the west, and wheat in the center and south. Its forests extend over 40 per cent of the surface—pine, fir, and birch in the north, oak, elm, and lime in the center and south. The northern forests abound with capercaillie, black game, ptarmigan, and hazel grouse; on many of the cultivated tracts of land the gray or common English partridge will be found. Bears, elk, and wolves are also plentiful in these extensive forests, and are frequently found within 40 miles of Petrograd. The steppes of the south are the great pastoral lands of Russia. The mining region of Russia in Europe is the Ural belt, which yields a large amount of gold, silver, copper, iron, lead, and platinum.

Climate.—The climate necessarily varies greatly in different parts of such a vast country as Russia in Europe. In summer it is warmer, but in winter much colder than in countries to the west in the same latitude. At Petrograd the average temperature of the year is about 39°; of the coldest month 13°, of the warmest 61°; but the thermometer at times rises to 85° or 90° in the summer, and falls to 22° below zero in the winter.

Regulations concerning visits of foreign men-of-war to Russian ports and waters.—The following regulations were sanctioned on January 5, 1914, and, of course, are not applicable during the present war:

1. Russian ports and waters, as regards the visits of foreign war vessels, are classified as follows—(a) Open. (b) Conditionally open. (c) Closed.

2. Open ports and waters include all except those enumerated in article 3 and those closed by special order.

3. Conditionally open ports and waters within the limits of this publication are as follows:

Ports.—Emperor Alexander III, Libau, Riga, and Ust-Dvinski.

Waters.—Moon Sund, from Wormsö to Worder, including the Nukke-Wormsö and Sele Sound Channels.

4. A port or new region is declared closed to the visits of foreign men-of-war by special order of the minister of marine, published for general information.

5. No special permission is required for the visit of a foreign man-of-war to the open ports and waters; previous intimation of an intended visit should, however, be given in good time through the usual diplomatic channels.

6. For the conditionally open ports and waters permission must be obtained, the request containing information as to what vessels, and when and for how long it is proposed to visit, definitely mentioned, ports and waters.

7. When permission from the Imperial Russian Government has been obtained, entrance is permitted between sunrise and sunset only.

8. The above regulations do not apply to vessels: (a) On board of which are embarked reigning sovereigns, members of royal families, presidents of Republics or their suites; also ambassadors and envoys accredited at the court of His Imperial Majesty the Emperor of Russia. (b) To ships which on account of force majeure or damage are compelled to seek shelter in Russian ports.

9. Foreign men-of-war so admitted must anchor in the berths allotted by the local authorities and observe the regulations in force in the port or waters regarding sanitation, order, safety, use of wireless telegraphy, and other local rules.

10. Foreign war vessels in either open or conditionally open ports and waters are in any case bound to put to sea at 10 hours' notice on receipt of an intimation to that effect issued in the name of the Minister of Marine.

11. The privileges afforded above may be curtailed and altered in the case of war vessels of nations which adopt stricter regulations toward Russian vessels in their waters.

*** Regulations for vessels approaching the Imperial Russian yachts, or Russian vessels of war, at anchor in Russian waters.**—The Russian Government has given notice that under certain circumstances it becomes necessary to prevent vessels entering certain anchorages or to limit the free choice of a fairway. Within Russian coastal waters, therefore, any vessel which, on approaching a bay or strait, shall see a squadron at anchor, or by night shall observe searchlights to be working, must approach the bay or strait with the greatest caution and strictly carry out all orders given by word of mouth, sign, or signal from the guardship.

The guardship, which may be cruising or at anchor, will hoist by day a special flag (blue, white, blue horizontal stripes), and by night will display one red light.

Three red lights by night or three balls by day, displayed from a mast on shore or from the guard ship, indicate that entrance to the bay or strait is absolutely prohibited; should, however, there be displayed the above-mentioned flag by day or one red light by night, the bay may be entered as directed by the guard ship.

Vessels when about 1 mile distant from the nearest ship of a squadron must reduce speed and await directions from the guard ship.

Should the letter L (— — —) of the Morse code be sounded from the guard ship by steam whistle or siren, or a gun be fired, the vessel must stop her engines or heave-to and await instructions.

Should no signal be made from the guard ship, the vessel entering may proceed into the bay, shaping her course so as not to pass between the vessels at anchor, but it is obligatory to pass between them and the shore.

Should the vessel entering fail to carry out the above-mentioned requirements, the guard ship may stop her by firing a blank charge. Should the first warning be unheeded, a shot will be fired at her rigging or sails, and should she, after this, still fail to stop or move away, she will be fired upon or rammed.

In places where the movement of vessels is restricted by the above-mentioned regulations, the movements of private motor boats, hydroplanes, and submarine boats is strictly prohibited, and they will be fired upon should they approach the line of guard ships.

The regulations for the movement of passenger steam vessels past the anchorage of the imperial yachts will be made according to the local conditions and will be notified to the harbor master, the pilots, and the guard ships.

The last two paragraphs apply when the imperial yachts are at the anchorage.

*** Regulations for vessels when meeting the Imperial Russian yachts underway.**—In the waters of the Russian Empire every vessel when approaching the imperial yachts must take measures in good time to move out of their course.

Should it be found necessary to warn any vessel, either steam or sailing, to depart immediately from the course of the imperial yachts, the leading ship will hoist three red balls by day or three red lights by night, and turn on her searchlight. On this signal being made, every vessel must immediately alter course and steer outside the line of the squadron. In case of necessity supplementary directions will be given by signal by the international code.

Should a vessel fail to carry out this demand, a blank charge will be fired in her direction. Should this warning remain unheeded, a shot will be fired at her rigging or sails, and should she, after this, not withdraw or not obey the signal, she will be fired upon or rammed.

*** Instructions for mercantile vessels approaching a Russian fleet underway.**—The Russian Government has given notice that the following rules are to be carried out by all private vessels approaching a Russian fleet in Russian waters:

* See footnote page 31.

Should it be necessary for a steamer or sailing vessel, when approaching, to keep clear of a squadron, the leading ship of the squadron will hoist by day the international code signal to that effect, in addition to three red balls. By night she will hoist three red lights and show a searchlight. Upon these signals being observed, all vessels must alter course at once, so as to keep outside the course of the squadron.

If these signals are not obeyed, a blank cartridge will be fired toward the approaching vessel. This will be followed by a shot with ball if still not obeyed.

Frontier guard.—Vessels of the frontier guard, when entering or leaving roadsteads at night, carry a white light over a blue light at the peak in order to distinguish them from merchant vessels.

Rules concerning the helm.—On board Russian vessels the order to starboard or port the helm will indicate that the vessel's head will turn to starboard or port.

Kaiser Wilhelm Canal.—This canal, connecting the North Sea and Baltic, was opened to deep-draft vessels in June, 1895, and now forms an alternative waterway for vessels of all classes trading to or from the Baltic. By it the passage from various parts of the North Sea is shortened in a more or less degree according to their positions, while the necessity of passing the intricacies of the Belts in unfavorable weather is avoided.

From the North Sea the canal enters at Brunsbüttelkoog on the Elbe River 15 miles above Cuxhaven, where there is a roadstead, having an area of $4\frac{1}{2}$ miles and with an average depth of 6 fathoms; in the approach to this roadstead from the North Sea the depth is not less than $4\frac{1}{2}$ fathoms. Thence it traverses Schleswig Holstein and enters Kiel Bay in the Baltic, at Holtenau, about 4 miles northward of Kiel.

The length of the canal is 53 miles, width at the bottom 72 feet, widened at the curves to 124 feet; the depth of water is 29 feet below mean water level.

The passing places are at an average distance of $6\frac{1}{2}$ miles apart; these are 1,500 feet in length and 197 feet wide at the bottom.

Entrance may be effected at any time and the canal may be navigated day and night by such vessels as do not exceed the following dimensions:

Length, 443 feet; breadth, $65\frac{1}{2}$ feet; draft of water, 26 feet; height of mast above the water line, 131 feet. For further details see H. O. No. 135, North Sea Pilot, and H. O. No. 141, Scandinavia Pilot.

Navigable season.—The navigable season in the Baltic may as a rule be considered to be April to December.

Further particulars relating to the opening and closing of the ports of the Baltic will be found with the description under each port.

Lights for pilot vessels.—Pilot vessels, when engaged on their station on pilotage duty, shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed 15 minutes.

On the near approach of or to other vessels they shall have their side lights lighted, ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port side, nor the red light on the starboard side.

A pilot vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board may show the white light instead of carrying it at the masthead, and may, instead of the colored lights above mentioned, have at hand ready for use a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above.

A steam pilot vessel, exclusively employed for the service of pilots licensed or certified by any pilotage authority or the committee of any pilotage district, when engaged on her station on pilotage duty, and not at anchor, shall, in addition to the lights required for all pilot boats, carry at a distance of 8 feet below her white masthead light a red light, visible all round the horizon, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 2 miles, and also the colored side lights required to be carried by vessels underway.

When engaged on her station on pilotage duty and at anchor, she shall carry, in addition to the lights required for all pilot boats, the red light above mentioned, but not the colored side lights.

Pilot vessels, when not engaged on their station on pilotage duty, shall carry lights similar to those of other vessels of their tonnage.

Pilots—Swedish coast.—Pilotage is compulsory in Swedish fairways for vessels in the service of a foreign State, which are not men of war, and for other vessels arriving from or leaving for abroad, with the following exceptions:

(a) Vessels whose dutiable displacement does not exceed 40 tons, provided they are not towing vessels subject to the obligation to employ a pilot.

(b) Vessels proceeding between Swedish and foreign ports eastward of a line between Lindesnaes and Hantsholm.

(c) Vessels which on account of victualling, coaling, death on board, or stress of weather, run into and afterwards proceed direct

to sea from a Swedish port or roadstead, without in any case landing other passengers than those who are ill or dead on board, or taking on board passengers, or discharging cargo, or loading other goods than provisions, coal, or maritime necessities for the ship's own use.

The Swedish pilots on the most important stations are provided with decked boats, with which they proceed to sea, even in stormy weather. At those stations where pilots have only small open boats, vessels should hoist the pilot signal and await the arrival of a pilot.

The Swedish pilots are required to pass an examination to insure their qualification to pilot all vessels of the drafts of water with which the fairways within their pilotage area can be navigated.

None but Government pilots are allowed to pilot vessels in Swedish waters, and it is only in case a Government pilot can not be met with that any other person may be employed, and then only as far as the next pilot station. Persons unlawfully acting as pilots, as well as commanders of vessels employing them, are subject to a heavy penalty in addition to the pilotage money due to a Government pilot for the distance passed over.

Pilot signals.—The following signals, made either separately or together, shall be understood as signals for summoning a Swedish pilot:

By day: (1) The national flag, hoisted at the fore. (2) The pilotage signal, "P.T.," of the international code. (3) The international signal "S," with or without the distinguishing pendant above. (4) A cone, point upwards, with two balls or two ball-shaped figures above it.

By night: (1) A blue light, shown every 15 minutes. (2) A bright white light, shown at frequent intervals, just above the bulwarks, about a minute at a time; flare-up or flash may also be shown. (3) A blue or white light, as shown in (1) and (2), together with a steady bright white light placed in the bows of the vessel, lower than the side lights. This latter light should be shown uninterruptedly.

In thick and foggy weather: Short and long blasts, or a series of one long and three short blasts on the steam whistle or foghorn.

At detached pilot stations the following signals are made at a mast: A black ball with white stripe indicates that pilots are on the station and can proceed out. The ball is lowered when the pilots are away.

Pilot boats carry a white and blue flag, and pilot cutters are further distinguished by a red cloth or the word *Lots* on the mainsail. By night, a *red* and *white* light is shown alternately.

Pilot steamers also carry a white and blue flag.

Swedish pilots, before boarding, or if unable to board a vessel, are instructed to indicate the proper course to be steered by using the pilot flag thus: Inclining the flag to starboard signifies "steer more

to starboard"; inclining it to port signifies "steer more to port"; holding it upright signifies "steady"; waving it from side to side signifies "heave to" or "stop."

Special flag.—Swedish pilotage steamers, when employed for purposes other than pilotage, show the following flag, in addition to the Swedish colors, viz. a burgee, one-third of it, nearest the hoist, white, bearing an anchor and royal crown in gold; the remaining two-thirds is of the blue of the national flag. The length of the burgee is twice its height. The steamer's funnel bears an anchor and rope surmounted by a star.

The following table shows the head pilot stations on the Swedish coast within the limits of this publication, with statistics for the year 1914:

MIDDLE PILOTAGE DISTRICT.

Pilot stations.	Dates of—	
	First pilotage.	Last pilotage.
Färösund.....	Jan. 1	Dec. 31
Sandhamn.....	do.....	do.....
Stockholm.....	do.....	do.....
Mälaren.....	Jan. 5	Dec. 30
Dalero.....	Jan. 1	Dec. 31
Hufvudskär.....	Jan. 3	Dec. 1
Landsort.....	Jan. 2	Dec. 31
Säbo und.....	Jan. 11	Dec. 21
Visby.....	Jan. 8	Dec. 28
Färösund.....	Jan. 13	Dec. 9
Kille.....	Jan. 1	Dec. 8
Slite.....	do.....	Nov. 29
Har ik.....	Jan. 3	Dec. 31
Långarn.....	Mar. 26	Dec. 2
Roneham.....	Feb. 17	Dec. 19
Burgsbik.....	Feb. 14	Oct. 15
Klungehamn.....	Mar. 5	Nov. 14

EASTERN PILOTAGE DISTRICT.

Nyköping.....	Mar. 9	Dec. 19
Oxelöund.....	Jan. 1	Dec. 31
Norrköping.....	Jan. 2	do.....
Arko.....	do.....	Dec. 29
Mem.....	Mar. 4	Dec. 13
Bäradsckär.....	Jan. 1	Dec. 25
Stedsholmen.....	Jan. 2	Dec. 23
Idö.....	Jan. 1	Dec. 31
Strupö.....	do.....	Dec. 16
Kräkelund.....	do.....	Dec. 19
Fågelholm.....	Mar. 16	Dec. 31
Oskarshamn.....	Jan. 1	do.....
Paskallavik.....	Jan. 16	Dec. 19
Vallö.....	Jan. 18	Dec. 17
Mönsterås.....	Jan. 14	Dec. 27
Timmerabben.....	Feb. 23	Dec. 17
Palaholm.....	Apr. 12	Nov. 10
Borgholm.....	Jan. 23	Dec. 22
Skaggenas.....	Jan. 1	Dec. 26
Kalmar.....	do.....	Dec. 28
Bergskarna.....	do.....	Dec. 26
Bogerhamn.....	Jan. 9	Dec. 29

SOUTHERN PILOTAGE DISTRICT.

Pilot stations.	Dates of—	
	First pilotage.	Last pilotage.
Långören.....	Mar. 1	Dec. 17
Aspö.....	Jan. 1	Dec. 31
Arpö.....	Feb. 21	Dec. 24
Gökaly.....	Jan. 2	Dec. 21
Tärnö.....	Jan. 12	Dec. 20
Karlshamn.....	Jan. 1	Dec. 23
Pukavik.....	Jan. 5	Oct. 22
Hanö.....	Jan. 9	Dec. 12
Sölvesborg.....	Jan. 2	Dec. 21
Ähus.....	Jan. 1	Dec. 30
Simrishamn.....	Jan. 4	Dec. 26
Ystad.....	Jan. 1	Dec. 31
Jönköping.....	do	do
Öresunds Södra.....	Jan. 2	Do.

German coast pilots will meet vessels off the ports on the German shore of the Baltic when the weather permits. The only authorized steering words of command of the German pilots are "Steuerbord" (Starboard) and "Backbord" (Port), and these apply to the direction to which the ship's head is intended to turn and not to the tiller.

Pilot signals.—The signal for a pilot of German nationality is as follows:

By day: (1) The jack or other national flag, with a white border one-fifth the breadth of the flag, hoisted at the fore. (2) The pilotage signal "P. T." of the International code. (3) The international signal "S.," with or without the distinguishing pendant above it. (4) A cone point upwards, with two balls or two-ball-shaped figures above it.

By night: (1) A blue light, shown every fifteen minutes. (2) A white light shown at frequent intervals just above the bulwarks, about a minute at a time; a flare-up or flash may also be shown.

If the pilot vessels or boats are unable to get out, the course the vessel should steer is indicated by a red flag or ball on a staff, and the vessel should steer toward the side to which the staff inclines, until it is placed in a vertical position, when she should be steered in the direction she is then heading so long as the staff remains in that position.

Russian coast pilots.—It is established that a pilot, and consequently also a pilots' association, is liable solely for mischances to a vessel due to the dangers of the channel, while the responsibility for any accident unconnected with the peculiarities of a fairway, and in particular for collision with another vessel, lies wholly on the master.

Uniform signals are used in all Russian harbors where official or private pilots are appointed. The signals are made either from the

pilot's lookout or from a flagstaff erected for the purpose. On the lookout there are three flagstaffs, the center staff vertical and the side staffs horizontal. When there are no pilot lookouts, flagstaffs with yards are erected where they can be best seen in every direction from seaward. (See tables of signals pages 59 and 60.)

Pilot boats carry a white flag and have a red vertical stripe on their sails. Pilot vessels fly at the stern a blue ensign, with the national flag in the upper quarter.

At night they show a red and white light alternately.

Vessels entering harbors without a pilot should signal the draft of water, and, if permitted, the signal "Enter harbor" will be made at the pilot station. A ball and flag will be hoisted on the directing beacon, which then signifies, when vertical, the vessel is steering the right course; if the beacon inclines, keep the side toward which the beacon inclines; a greater or less inclination indicates keep more or less toward that side in order to keep the right channel. If the vessel be observed standing into danger, the directing beacon will assume a horizontal position, when either proceed to sea or anchor immediately.

Coal—Swedish coast.—Coal in excess of 500 tons is stored and can be obtained at the following Swedish ports: Kalmar, Karlskrona, Norrköping, Oskarshamn, Oxelösund, and Stockholm; a smaller supply is procurable at Nyköping, Västervik, and Ystad.

Danish.—Coal can be obtained at Rönne, in Bornholm, upwards of 500 tons being kept in store.

German coast.—Coal can be obtained in large quantities at Danzig, Memel, Pillau, Stettin, and Swinemünde; some may probably be had at Sassnitz and Stralsund.

Russian coast.—Coal can be obtained in excess of 500 tons at Riga; a smaller supply at Libau, Pernau, and Windau; and a small quantity occasionally at Kertel.

Lights.—The lights on the Swedish coast are exhibited all the year round, from a quarter of an hour after sunset until sunrise, unless the navigation within the range of a light is stopped by firm sea ice. Harbor and leading lights are subject to the same rule unless otherwise stated on the charts or in the light list.

Russian lights are shown from sunset to sunrise. The principal lights are shown when navigation is open. Minor lights, south of latitude 62° north, are shown while navigation is open, except from June 24 to July 7. There are a few exceptions to the above rules, which are noted in the light list and on the charts.

No notice is given of the commencement and cessation of the illumination of lighthouses and lights, depending on the state of ice on the sea.

Light vessels.—**Swedish** light vessels are painted red, with the name in white letters on both sides, the large vessels generally have two masts, or one mast and a tower for the light, or they may have only one mast or a tower; they carry at their mastheads red skeleton balls to the same number as the lights shown. They occupy their stations until driven from them by ice; if the vessels drift from their position by any cause the balls are struck. A gun is fired if a vessel is seen standing into danger.

When Swedish light vessels are replaced by a reserve light vessel, the latter is painted red with the word "Reserv" in large white letters on each side.

German light vessels are painted red, with the name on each side in white letters. By day they carry the same number of balls or cages as the lights they display by night. When a German light vessel is off her station she lowers her day marks when practicable and hoists a large dark flag on her foremast; during the night only the anchor lights are shown. Vessels over 150 feet in length carry the second anchor light.

Russian light vessels are painted red with a white vertical or horizontal streak, with the name or initial in black. The distinguishing marks at the mastheads consist of a ball or flag, or a ball and flag combined; a description of each is given in the text.

In case of a Russian light vessel being withdrawn from her station for any cause she will be replaced by a relief light vessel having the following characteristics: A fixed white light, elevated 49 feet, visible 12 miles, and a green light under the white riding light. Fog signals: A siren will give 1 blast of 10 seconds duration every 55 seconds (if disabled a loud whistle will be sounded frequently or the vessel's bell rung), and a submarine bell will be sounded thus: 2 strokes, interval 3 seconds; 2 strokes, interval 9 seconds. The hull is red, with a white horizontal streak on each side marked "Запасный" in black, and the vessel has two masts, each with a red ball. The usual signals with flags and rockets will be made to warn vessels standing into danger.

Russian light vessels, when a vessel is observed to be standing into danger, hoist the signal "J.D." and fire rockets, each of which gives two reports, one on being fired, the other in the air as a warning, every minute, until the vessel observes the signal. By night the rockets only are used.

Light vessels fly at the stern a blue ensign with the national flag in the upper quarter; and at the main a yellow flag with upright blue cross.

Light vessels are liable to be withdrawn for repairs, without notice, and are replaced by relief vessels.

Riding lights.—German and Russian light vessels carry a white light on the forestay for the purpose of showing in which direction the vessel is riding.

Uniform systems of buoyage—Swedish system.—The Swedish system of buoyage consists of plain, broom, cross, and ball spar buoys. Plain spar buoys have their upper half painted white, and the lower half painted black.

Broom buoys are painted red, and are surmounted by brooms, either upturned or downturned; they may be also furnished with balls.

Cross buoys are painted black and red in horizontal bands, which are about 20 inches in breadth; they are surmounted by a cross, painted one-half black and one-half red, and balls are sometimes employed.

Balls, of which one or more may be used, are either constructed of strips of wood fastened to the buoys, or of basketwork. As a rule, all red spar buoys will be furnished with one or more brooms, although other topmarks may be met with, but are extremely rare.

Light, bell, and whistle buoys mark certain dangers and are of various shapes. The first remain out all the year, unless otherwise stated, or their removal is necessitated through ice, and the two last are only removed for the latter reason. When these are withdrawn, their place is taken by plain spar buoys.

Iron or wooden buoys are also employed, one of the latter floating just level with the surface, and surmounted by a pyramid, formed of strips of wood, but this is only employed in inner channels.

The general rule regarding the buoyage of channels (not including shoals, or banks, that extend in other directions than towards the fairway) is that spar buoys and beacons on the north and east side are painted red and surmounted by a broom, while those on the south or west sides are black and white or black.

Shoals, or banks in the open sea, outside the skärgård and inner channels, are beacons as follows, and may be surmounted by balls, or other topmarks, or be without such.

The northern side of a shoal or bank by black spar buoys.

The eastern side of a shoal or bank by spar buoys, painted black, with a white band, $3\frac{1}{4}$ feet broad, in the center.

The southern side of a shoal or bank by red spar buoys surmounted by one or more upturned brooms.

The western side of a shoal or bank by red spar buoys surmounted by one or more down-turned brooms.

Wrecks are marked by green spar buoys, light buoys exhibiting green lights, or by light vessels.

Fixed seamarks.—The fixed seamarks consist of beacons, cairns, pole, or stake beacons, and fixed perches.

Beacons are usually towers or similar buildings.

Cairns are built of stone or concrete, and are generally conical shaped. In this work they are also called beacons.

Pole, or stake, beacons, usually consist of a pole with stays, with boards sometimes fixed to either. The top marks may be of different forms.

Fixed perches mark banks or rocks, partly above water, and are either red with a triangular top mark of strips of wood, with a down-turned point and surmounted by a broom, answering to a broom, or red ball buoy; black, with triangular top mark of strips of wood, with point upturned, answering to a plain black and white or black ball buoy; or else black and red, with two triangular top marks of similar make, with points turned toward each other, and the upper painted red and lower black; this corresponds to a cross or black and red ball buoy.

When light vessels, buoys, and such spar buoys as are liable to injury are withdrawn at the close of navigation, in consequence of ice, they are in some localities replaced by temporary sea marks, and at the opening of navigation in the spring they are replaced, those marking main fairways for shipping being first laid out.

Swedish system—Caution.—The attention of mariners is called to the fact that in the winter months, on account of storms and ice, the buoys and floating sea marks on the Swedish coast may be lost, forced out of position, or altered in appearance through the loss or damage of the top marks. Repairs or corrections are impossible during the winter months on account of the weather conditions, so that especial care is necessary during this season.

Light buoys, light and whistle, and light and bell buoys.—The light buoys and also light and whistle buoys, which in Swedish waters are used at shoals in the open sea, are acetylene buoys, and generally show white lights with short flashes with long or short intervals between the flashes. Red lights or group flashing lights are only used where a flashing white light is liable to be confused with another light buoy or a light vessel in the neighborhood. The buoys are painted in accordance with the rules for Swedish marks in the open sea, and are not given top marks on account of the ice.

Green lights and green color for light buoys in the open sea is used only for wrecks.

In channels, harbors, anchorages, and roadsteads, in addition to acetylene buoys there are old oil gas buoys in use, and one acetylene light and bell buoy. These old buoys show either fixed white or colored lights, or alternating white and red lights. The acetylene buoys show either white or colored lights with one short flash or two short flashes in quick succession. The buoys are painted in accordance with the rules for coast channels in Swedish waters.

When going from seaward to the harbor or anchorage the buoys on the starboard hand show fixed white or green lights or white and red alternating lights, or white light with two short flashes in quick succession; those on the port hand show fixed white or red lights, or alternating white and red lights, or white or red lights with one short flash.

The light buoys with colored lights in Kalmarsund deep channel form an exception to the above rule, as those on the west side of the channel show green lights with one short flash, and those on the east side red lights with one short flash.

To ascertain the position of a light buoy with reference to the shoal the chart should be consulted, or if the light buoy is not shown on the chart, the Stockholm notices for the year if available. The position of light buoys showing fixed colored lights, with reference to the channels, may, however, be ascertained from the above rules.

German system of buoyage.—The seaward entrances of channels on the German coast not marked by light vessels, beacons, or moles, have beacon buoys of the same colors as the channel buoys, moored as approach or fairway buoys, in such a position seaward, that the outer channel buoys can be plainly seen from them.

The term "starboard hand" denotes that side of a channel which lies on the right hand of the mariner when entering from seaward; and the term "port hand," the left hand under the same circumstances.

Where a channel connects two parts of the sea, or two sheets of water separated by banks, the term "starboard hand" denotes that side which lies on the right hand when entering from a westerly direction between north inclusive and south exclusive; and the "port hand" that on the left. If the channel is so crooked that doubt exists as to which is the starboard and which is the port side, the entrance lying most to the north is to be the deciding one for the whole fairway in connection therewith.

Buoys surmounted by central beacon-shaped structures, bell buoys, gas buoys, and automatic whistle buoys are termed "Beacon."

Buoys showing a spar above water are termed "Spar buoys."

Buoys formed like a cone above water are termed "Conical."

Buoys showing a flat top are termed "Can buoys."

Buoys showing a hemisphere above water are termed "Spherical buoys."

Buoys in the form of a barrel or cylinder, showing the arched surface above water, are termed "Barrel buoys."

Beacons are scaffoldlike or complete structures, having a form which rises sharply against the background and catches the eye.

Beacons consisting of a group of piles are termed "Dalben" (dolphins), those on the starboard side, entering, having a pole as top mark.

Stake marks (perches) consist of single stakes or perches driven into the ground; these may be surmounted by brooms, wisps of straw, or the like.

Pricks (priken) are young trees with branches, or branches only driven into the ground.

When channel buoys or beacons have a serial marking with letters or numbers, these are Roman and Arabic, respectively, are painted white, and run consecutively from the outermost. Channels of considerable length may be subdivided, and each section marked with a separate series of letters or numbers.

Intermediate buoys introduced additionally into the buoyage of a channel have, when starboard buoys are concerned, the marking A1, A2, or B1, B2, etc.; and, when port buoys are concerned, the marking 1a, 1b, or 2a, 2b, etc.

Starboard-hand buoys are spar buoys painted red; or where several channels are near each other, or the water not sufficiently deep for spar buoys, can buoys may be used.

Port-hand buoys are conical and painted black.

If stationary seamarks are used, those on the starboard hand consist of beacons, with spars, painted red, or perches, and those on the port hand of beacons without spars, painted black, or by pricken.

Mid-channel buoys, which may be passed on either side, are spherical buoys painted in red and black stripes.

The extremes of shoals extending from the shores into the channel, or reefs in channels or branching fairways, are marked by beacons or beacon buoys painted in red and black stripes.

The extremes of middle grounds are marked by beacons or beacon buoys, painted in red and black stripes and surmounted by an upright cross.

Shoals lying seaward of channels are marked by spar buoys, beacon buoys, or beacons.

Should a shoal be so small that it can be marked by a single buoy or beacon and passed on any side, the buoy or beacon is placed on the shoal, painted in black and white stripes, and surmounted by a drum, the height and diameter of which are equal.

Buoys and beacons marking the edges of shoals seaward of channels are painted white and surmounted by two vertical equilateral triangles arranged as follows, the space between the triangles being equal to the height of one triangle:

- (1) When on the northern edge of the shoal the points of both triangles turned upwards.
- (2) When on the southern edge of the shoal the points of both triangles turned downward.
- (3) When on the eastern edge of the shoal the points of both triangles turned away from each other.

(4) When on the western edge of the shoal the points of the triangles turned toward each other.

The name of the shoal, either in full or abbreviated, is painted on the buoys and beacons marking it in black letters, and buoys and beacons on the edges of shoals have the letters N., S., O., or W. painted on them in black letters to correspond with the side of the shoal on which they are situated.

Should it appear necessary to prevent the confusion of several shoals lying close to each other or of seamarks lying on one side of the same shoal, different top marks or other distinguishing marks besides those laid down may be affixed.

Wreck-marking buoys are either can, conical, or barrel buoys, painted green, with the word "Wreck" (wreck) painted on them in white letters. The top marks on wreck buoys are similar to those used for marking shoals seaward of channels.

Wreck buoys, when light-buoys, show an occulting green or flashing green light.

Buoys marking the position of telegraph cables are spherical buoys, painted green, with the word "Telegraph," or T, painted on them in white letters.

Buoys marking the boundaries of quarantine grounds are either can, conical, or barrel buoys painted yellow.

Buoys marking firing, mining, and torpedo trial grounds are barrel buoys painted yellow and surmounted by a small red flag.

Buoys and beacons for mooring purposes, or to define the boundaries of a roadstead, or used for surveying purposes, are so constructed in shape, color, and top marks to prevent their being mistaken for any other buoys or beacons in the vicinity.

Buoys moored in the fairway for warning purposes (whistle buoys as advanced fog-signal stations, etc.), however passable they may be on all sides, are black and white checkered and carry the name of the place recorded on the chart which lies nearest to them. This regulation does not refer to approach buoys, wreck buoys, mid-channel or middle-ground buoys.

Top marks may consist of all bodies which stand out well, owing to their form, and are used separately or in combination; small flags may also be used.

The drum and combinations of equilateral triangles used for marking shoals lying seaward of channels, and wrecks, are not used for top marks of channel seamarks.

Top marks are fixed to the point of special poles, which project above the seamark proper, except with spar buoys and perches, where they are fixed to the seamarks themselves.

The color of the top mark need not coincide with that of the seamark upon which it is fixed, except in the case of wreck and quaran-

tine buoys, when the top mark must be of the same color as the buoys.

Russian system of buoyage.—Shoals in Russian waters of the Baltic are marked as follows:

The north side of a danger by a white spar buoy with a black broom turned downwards, or with a black ball below the broom.

The south side of a danger by a red spar buoy with a red broom turned upwards, or with a red ball below the broom.

The east side of a danger by a spar buoy, of which the upper half is white and the lower part red, with two red brooms turned from each other, or with a red and white ball below the brooms.

The west side of a danger by a spar buoy, of which the upper half is black and the lower part white, with two black brooms turned toward each other, or with a black and white ball below the brooms.

Dangers in the open sea and the sounds that may be passed on either side are marked by a buoy surmounted by a cross consisting of a spar with red and white bands and red crossbeam with a black ball under it.

Dangers within the Skerries that may be passed on either side are marked by a buoy with a similar cross to the above, but without the ball.

Other than spar buoys placed to mark dangers are in every case surmounted by a staff, with the same top marks and coloring as the spar buoys described above, with reference to the side of a danger on which the buoy is placed; these buoys are painted similarly to the staff attached to each.

The mouths of rivers are marked by white buoys on the starboard hand and black buoys on the port hand when entering.

Winter buoyage.—On the close of navigation in the autumn, in consequence of ice, the light vessels, buoys, and such beacons as are liable to injury are removed, and in some localities the buoys are replaced by temporary seamarks.

On the opening of navigation in the spring, the summer marks are again placed in position, those marking main fairways for shipping being laid out first.

The summer buoy is shown on the charts.

The alterations in the German buoyage which are introduced in winter can be seen in the list of winter seamarks annexed to the "Nachrichten für Seefahrer" at the beginning of October of each year.

Wreck-marking vessels.—When light vessels or other craft are placed to mark the position of a wreck in German and Danish waters they will be distinguished as follows:

By day.—Three black balls from a yard 20 feet above the sea; two placed vertically on one yardarm and one on the other yardarm.

By night.—Three fixed white lights, similarly arranged.

Vessels should pass on that side of a wreck-marking vessel on which two balls or two lights are shown.

German light vessels marking wrecks are painted green, with the word "Wrack" in white letters on each side; anchor lights are not shown. Light buoys marking a wreck in German waters show a flashing or occulting green light, and when a light is placed on the wreck itself a green light will be shown 5 feet above a white one.

Marking of salvage vessels and marine works, Germany.—To admit of greater protection against disturbance and danger to the works to be carried out by salvage vessels and inshore works in German waters, a red cylinder will in future be shown upon these vessels and works by day, and by night three lights, white, red, and white, vertically one above the other, 5 feet apart.

Signals shown by German steam dredgers.—The following signals are shown by the steam dredgers employed in German coastal waters (with the exception of those moored in the lower Weser) to indicate the side on which the vessel may pass.

By day.—A red ball.

By night.—Two lights placed vertically; upper light, red; lower light, white.

The signals to indicate the side of a dredger on which vessels may not pass, or the special signals to be shown should a channel be completely blocked by a dredger, are in every case decided by the local authorities.

Fog signals—Caution.

Russia.—Fog bells at Russian lighthouses and light vessels are sounded, unless otherwise stated, in the following uniform manner:

(a) At lighthouses.—In groups of 2 strokes, the interval between the groups being not more than 3 minutes.

(b) On board light vessels.—In groups of 3 strokes, the interval between the groups being not more than 2 minutes.

When the fog signal of an approaching vessel is heard the intervals between the double or triple strokes in the groups are reduced and the bell sounded continuously in double or triple strokes until the vessel is past the light or clear of danger.

The above method of sounding fog bells has been introduced in order that the bells of churches near the coast may not be mistaken for fog signals.

Submarine fog bells have been fitted to several light vessels mentioned in this work.

Winds and weather.—During the summer months the winds are usually very variable and, at quite short distances apart, blow from different directions. In the inner channels (within the Skerries) it often blows a strong off-shore wind, while it is quite calm at sea.

During the spring and early summer northerly and easterly winds prevail, while in the late summer and autumn the winds become southerly and westerly; the heavy gales of autumn are often southeasterly.

In summer, culminating in July, calm and dry weather with thick haze is experienced, making it very difficult to distinguish the land at a short distance; this is dispersed by gales or continued rain.

When the dew falls early in the evening fine weather with easterly winds may be expected, but if the dew continues the whole night a change of wind or rain may be anticipated; should the night at the same time be cold it indicates northerly or northwesterly winds, but should the air be sultry and damp in the morning with a grayish-blue sky there will probably be stormy weather or rain. These observations have been made during a considerable period, but only during the summer, and have shown themselves to be tolerably reliable.

The barometer gives good warning of approaching bad weather in the Baltic; it is usually very high immediately before easterly winds and correspondingly low with those from southwest.

Fog and mist.—The following statement of the percentage of frequency of fog and mist in the Baltic has been taken from diagrams furnished by the Meteorological Office, based on four-hourly observations taken on board ships during the 30 years ended 1908. The northern and eastern limits of the Baltic, for this purpose, are taken as latitude 60° north and longitude 26° east.

MARCH.

Fog: No data.

Mist: Above 10 per cent in the southwestern part westward of the meridian of the south point of Öland. No data for remainder of Baltic.

APRIL.

Fog: Insufficient data.

Mist: Above 20 per cent westward and southwestward of Gotland and along the coast of Karlskrona. Less than 20 per cent in the southwestern part, southwest of Öland and west of Bornholm. Insufficient data for remainder of Baltic.

MAY.

Fog: Less than 10 per cent over Baltic, except in eastern part lying southward of the north point of Gotland and Lyserort and eastward of Gotland and the meridian of 18° east, where there is no fog.

Mist: Above 20 per cent northward of a line drawn eastward from the south point of Öland then curving northward, passing about midway between Gotland and the Russian Coast, and then eastward through the south point of Ösel. Above 10 per cent eastward, southward, and westward of the last line, to one drawn from Falsterbo to near Kolberg; and less than 10 per cent to the westward of this.

JUNE.

Fog: No fog.

Mist: Above 10 per cent, except along the south coast of Sweden, and the coasts of Germany and Russia northward from Brüster ort, to and including the Gulf of Riga, where it is less than 10 per cent.

JULY.

Fog: Less than 10 per cent in southwestern part of Baltic included within a curve drawn from Oskarshamn round the north end of Gotland and southeast and southward to three-quarters the distance between that island and the Russian coast, thence southwestward to the German coast in about longitude 18° east.

Mist: Less than 10 per cent westward of a line from Åhus in Sweden to Funkenhagen, passing east of Bornholm. Above 10 per cent between the last line and one drawn from the south end of Öland to Scholpin Light, with a bend eastward. Less than 10 per cent between the last line and the coast of Sweden on the west, and lines drawn from Gotland, north-northeastward, and southward to Putziger wick, on the east. Elsewhere, insufficient data.

AUGUST.

Fog: Less than 10 per cent between the coast of Sweden and lines drawn from the south end of Gotland through the south point of Öland to Torhamns udde, and from the north end of Gotland north-northeastward.

Mist: Above 20 per cent between the coast of Sweden and a line drawn north-eastward from about Westervik to latitude 60° north, longitude 20° east. Above 10 per cent between the last line and one drawn from the Peene River entrance through the southeast point of Bornholm, 15 or 20 miles east of Gotland, and through the east point of Dagö to latitude 60° north, longitude about 23° east. Less than 10 per cent between the last line and one drawn from Jerishöft to Lyserort and the southeast side of Ösel. Elsewhere, insufficient data.

SEPTEMBER.

Fog: Above 10 per cent over an elliptical area about 220 miles long northeast and southwest, by 50 to 60 miles wide, situated east and northeast from Gotland, and extending from southward of that island to the entrance of the Gulf of Finland. Less than 10 per cent over the remainder of the Baltic, except westward of a line between Åbbekås in Sweden and Funkenhagen, in the light between Hela and the coast a little southward of Libau, in the Gulf of Riga, in the Gulf of Finland eastward of longitude $23^{\circ} 50'$ east, and off the coast of Sweden northward off latitude 58° , in which areas no fog is shown.

Mist: Above 10 per cent westward of a line drawn from the Swedish coast in the southern part of Norrköping bugt, eastward and curving southward to the west point of Gotland, and southward on the meridian of the south point of that island to the German coast. Less than 10 per cent eastward of the above lines.

OCTOBER.

Fog: Above 10 per cent southwestward of a curve drawn from the Swedish coast in about latitude $57^{\circ} 10'$ north, through Gotland about one-third from the north end, then eastward about two-thirds the way to the Russian coast, and thence southwestward to the German coast in about longitude 17° east. Less than 10 per cent over the remainder of the Baltic southward of a line

drawn from the Swedish coast along the parallel of 58° north to longitude 21° east, and thence to Lyserort, except over an area in the southeast formed by a curve extending westward from the coast in latitude 56° north, and then southward to the coast in longitude 18° east, in which there is no fog.

Mist: Above 20 per cent over an elliptical area about 210 miles long and 40 to 50 miles wide extending northeastward in the middle of the Baltic, from southeastward of Bornholm to abreast the east point of Gotland. Above 10 per cent over all the remainder of the Baltic, except in the bight between Putzger wiek and Pappenze lake, and in the Gulf of Riga, where it is less than 10 per cent.

NOVEMBER.

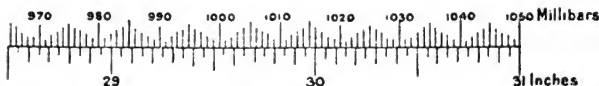
Fog: Less than 10 per cent is found within an area between the coast of Sweden and lines drawn from latitude 60° north, longitude 20° east, to the north end of Gotland, and from the south end of that island to the Pommersche bucht; the western limit of the area being the meridian of 14° east.

Mist: Above 20 per cent westward of a line from Abbecks in Sweden, southward to the Peene River entrance. Above 10 per cent westward of a line drawn from the western side of the Pommersche bucht northeastward to the western point of Gotland, thence to the parallel of 60° north, in about longitude $19^{\circ} 35'$ east. Less than 10 per cent over the remainder of the Baltic eastward of the last line.

Fogs and mirage.—Fogs are most prevalent in the Baltic during the months of May, July, September, and October. Mist is frequent in all months. *See* statement of fog and mist.

Mirage is common during the summer months; small rocks appear like high castles or towers, and objects are seen at almost incredible distances. It is generally considered an indication of fine weather, but when objects are much distorted unsettled weather may be expected.

Barometer.—The graduation of barometric scales in millibars having now been largely introduced, the accompanying diagram is inserted to enable the mariner to convert millibars into inches and vice versa.



Storm signals—Swedish coast.—Storm warnings are notified either on a board or by means of cones and balls on a signal mast, as follows:

One cone, point upward: Gale expected between north and east.

One cone, point downward: Gale expected between south and west.

One ball: Gale expected, no direction signified.

One cone, point upward over ball: Storm expected between north and east.

One ball over cone, point downward: Storm expected between south and west.

Two balls placed vertically: Storm expected, no direction signified.

A gale is considered as having a velocity of 40 to 65 feet per second, or a force of from 7 to 9, and a storm a velocity of from 65 to over 100 feet per second, or a force of from 10 to 12, according to the Beaufort scale. These signals are made from a mast.

German storm signals.—The storm-warning signals in use at nearly all the stations on the German coast are made by black cones, as follows:

1. A cone, point downward, indicates a storm from southwest.
2. A cone, point upward, indicates a storm from northwest.
3. Two cones, vertical, points downward, indicate a storm from southeast.
4. Two cones, vertical, points upward, indicate a storm from northeast.

One red flag indicates that the wind will probably veer from left to right, or in the direction of the hands of a watch.

Two red flags indicate that the wind will probably back from right to left, or against the hands of a watch.

At a few of the less important stations under provincial control a ball only is hoisted, signifying that an atmospheric disturbance is approaching, particulars of which can be obtained at the signal station.

Every station is provided with a box, in which the telegram, containing the reasons for hoisting the signal, is deposited, for inspection by the public. Further information may be obtained from the signal officer if required. For list of storm-signal stations, see page 51.

At night, a red light is hoisted, in place of the day storm signals, excepting in ports where the same might be confused with other red lights.

Experimental night storm signals.—The following night storm signals are shown, on trial, from the yard of the signal mast of of the storm-signal stations at Arkona, Hela, Pillau, Bruster Ort, and Memel:

Two red lights vertical, storm from northwest; two white lights vertical, storm from southwest; red light above white light, storm from northeast; white light above red light, storm from southeast.

Atmospheric disturbance.—One red light at night has the same signification as the ball by day, except at Arkona, where two red lights horizontal are shown.

Since the trial is particularly to determine whether the danger of confusion with other light signals stands in the way of these two-lantern signals, the transmission of appropriate experiences or opinions to the Deutsche Seewarte in Hamburg would be welcome.

Wind semaphores.—In addition to the storm cones at German coastal stations, there has been established a system of signals by

semaphore to indicate the direction and force of the wind at two favorably situated points on the neighboring coast, one on each side of the station. These signals are made by movable pairs of semaphore arms similar to those used at railway stations.

During calm weather all the arms hang vertically downward.

The force of the wind is indicated by showing the arms as follows: One arm when the force of the wind is 1 to 2 of Beaufort scale; two arms when the force of the wind is 3 to 4 of Beaufort scale; three arms when the force of the wind is 5 to 6 of Beaufort scale; four arms when the force of the wind is 7 to 8 of Beaufort scale; five arms when the force of the wind is 9 to 10 of Beaufort scale; six arms when the force of the winds is 11 to 12 of Beaufort scale. With only four arms, and all up, the force is between 7 and 12.

The direction of the wind is shown by vertical discs, provided with clock hands, placed behind the lowest pair of arms. The discs are arranged after the manner of the dial face of a clock, North being in the place of the figure XII, South in the place of the VI, and so on. By this arrangement the force and direction of the wind can be indicated.

Information in connection with the storm and other wind signals is transmitted to the coast stations three times daily, from the Imperial Meteorological Institute at Hamburg.

Special wind signals are shown at Hela, Schiewenhorst, Pillau, and Memel.

Pillars to indicate the direction and force of the wind at Arkona and Brüster Ort have been erected at Kolberg, Rügenwaldermünde, Stolpmünde, and Leba.

The following are the principal storm-signal stations established on the Baltic coast of Germany; day and night signals are shown, except at those stations noted as showing them by day only:

Name of station.	Latitude north (approximate).	Longitude east (approximate).	Remarks.
Cape Arkona.....	54 41 00	13 26 00	The signal staff is about 50 yards northwestward from the lighthouse. Day only.
Königs Hörn.....	54 35 00	13 29 00	
Stubbenhammer Cliffs (northeast point of Jasmund).....	54 34 15	13 40 20	
Sassnitz.....	54 31 00	13 39 00	Do.
Peerd Point.....	54 20 30	13 46 00	Do.
Thiessower Höft.....	54 16 30	13 43 00	The signal post is about 100 yards southward of the chief pilot's house. Day only.
Vierow.....	54 8 00	13 35 00	
Stralsund.....	54 18 30	13 5 40	
Greifswald Oie.....	54 15 00	13 55 40	The signal staff is 82 yards northeast of lighthouse.
Strehlsberg.....	54 3 30	14 1 00	
Ahlbeck (northwest of Swinemünde).....	53 56 30	14 12 30	
Swinemünde.....	53 55 00	14 17 00	The signal staff is on the east side of the harbor. Day only.
Stettin.....	53 25 30	14 34 00	
Misdroy.....	53 56 00	14 27 30	
Kiesberg.....	53 59 00	14 25 15	
East Dievenow.....	54 1 15	14 44 00	
Gross Horst.....	54 6 00	15 4 00	

Name of station.	Latitude north (approximate).	Longitude east (approximate).	Remarks.
Kolberg.....	54 11 00	15 33 30	The signal staff is on the west bank of the river Persante. Day only.
Nest.....	54 16 00	16 6 00	Day only.
Rügenwaldermünde....	54 26 30	16 23 00	The signal staff is on the west bank of the river, close to the pilot office. Day only.
Stolpmünde.....	54 35 00	16 51 30	The signal staff is northeastward of the pilot house. Day only.
Leba.....	54 45 30	17 34 00	Day only.
Stilo.....	54 47 00	17 44 00	The signal staff is close westward of the lighthouse. Day only.
Karwen.....	54 50 00	18 13 00	Day only.
Chlapau.....	54 48 30	18 23 00	Day only.
Ceynowa.....	54 45 30	18 31 00	
Pütziger Heisterneest....	54 42 15	18 40 45	
Hela.....	54 36 00	18 49 00	The signal post is on a sandhill about 330 yards southward of the lighthouse.
Oxhöft.....	54 33 00	18 34 00	
Zoppot.....	54 27 00	18 34 45	
Neufahrwasser.....	54 24 30	18 39 45	The signal staff is 45 yards northward of the lighthouse.
Ostlich Neufahr.....	54 24 30	18 47 00	
Schluwenhorst.....	54 20 15	18 54 45	
Vogelsang.....	54 1 15	19 17 45	
Kahlberg.....	54 23 00	19 27 00	
Neukrug.....	54 26 15	19 37 00	
Pillau.....	54 38 30	19 53 30	The signals are hoisted at the middle leading beacon.
Palmnicken.....	54 52 30	19 56 30	
Brüster Ort.....	54 58 00	19 59 00	The signal staff is about 200 yards northward of the lighthouse.
Neukuhren.....	54 57 30	20 15 00	
Kranz.....	54 58 00	20 29 30	
Nidden.....	55 18 30	21 00 00	
Schwarzort.....	55 32 40	21 7 30	
Memel.....	55 43 00	21 7 30	The signal staff is near the pilot office.
Försterel.....	55 46 00	21 5 00	
Kärkelbeck.....	55 50 00	21 4 00	
Nimmersatt.....	55 52 30	21 3 45	

Radio storm warnings relating to the German Baltic coast are circulated by the radio station on Bülk Point immediately on receipt of the warning, and also at 1 p. m. and 11 p. m., mid-European time, corresponding to noon and 10 p. m. Greenwich mean time. The warnings will consist of not more than 15 words, indicating the cause of the danger, the winds to be expected, and the storm signals to be made.

Vessels equipped with radio apparatus are requested to notify the storm warning to other vessels in the daytime by means of signals made by a black ball and cones, used in the same manner as the storm signals on the German coast; by night the signals will be made by Morse lantern or two hand lanterns, by the Morse signals, several times repeated:

Morse signal.	Signification.	Remarks.
	Atmospheric disturbance.....	Takes the place of ball.
	Storm from northwest.....	Correspond to the day signals with cone, the dot representing the apex, and the dash the base of the cone.
	Storm from southwest.....	
	Storm from northeast.....	
	Storm from southeast.....	

A call or closure signal is not given. The shifting of the wind is not signaled by day or night.

The storm warnings hold good up to the commencement of darkness on the evening of the day following the day of issue, when the

signals are discontinued; the same happens on the receipt of a telegram "Storm danger past"; while a telegram "Danger still existing, keep signal hanging," causes the signal to be shown until the evening of the following day.

Vessels in the Baltic can, at their own request and upon payment of the fees, receive radio weather reports from the stations at Bulk (call letters, K.B.K.), Swinemünde, and Danzig. The report will consist of not more than 20 words, and will contain the time of issue of storm warning and, under certain circumstances, the words "right turning" or "back turning." The fee is 3 cents per word.

Radio weather reports relating to the North Sea and Baltic are issued daily at 1 p. m., mid-European time, corresponding to noon Greenwich mean time, from the Norddeich radio station. The report consists of not more than 25 words, and contains a summary of the observed distribution of atmospheric pressure over Europe at 8 a. m., information as to the wind conditions of the North Sea and Baltic, and a weather forecast.

When necessary, storm warning signals are also to be made.

The storm warning signals and weather reports, when made by radio, will be sent on the 1,650-meter wave length.

The storm warnings and weather reports are issued, it is presumed, in the German language.

Russian storm signals.—Storm warnings are regularly transmitted to the stations at Libau, Windau, Ragotsem Point, Kaurgerzem, Riga, Ust Dvinski, and Pernau from the Nicholas Central Physical Observatory at Petrograd.

The hoisting of any of these signals indicates that the atmospheric conditions are such that in the neighborhood of the station the wind, in the course of a short period of time, up to 48 hours, may attain the force of a gale from the quarter indicated by the signal.

These notices relate to atmospheric disturbances which cover considerable regions, and must not be relied on to foretell local gales and disturbances. Navigators must in these cases be guided, as heretofore, by local manifestations.

The reports as received are exposed for general information.

Signal.		Signification.
By day.	By night.	
1. Black cone, point up.....	Three red lights in form of triangle, point up.....	Gale probable, commencing at Northwest.
2. Black cone, point down.....	Three red lights in form of triangle, point down.....	Southwest.
3. Two black cones, placed vertically, points up.	Three red lights in form of triangle, point up, surmounted by 1 red light.	Northeast.
4. Two black cones, placed vertically, points down.	Three red lights in form of triangle, point down, with 1 red light below.	Southeast.
5. Two black cones, bases together.	Three red lights in form of triangle, point down, surmounted by 1 red light.	Strong gale.

RUSSIAN RADIO WEATHER REPORTS AND STORM WARNINGS.

In order to acquaint mariners in the open sea of the state of the weather in the Baltic Sea and the adjoining waters, the Nicholas Central Physical Observatory, Petrograd, dispatches daily, between 2 and 3 p. m., a telegram ("marine dispatch") to Libau, Riga, and Revel, whence this information will be transmitted by radio.

Each telegram will contain the morning observations of 10 meteorological stations, referring to the atmospheric pressure, the wind (direction and force), state of the clouds, and the temperature, as indicated below in the instructions, where are given also rules for deciphering such a dispatch.

Instructions for deciphering the "marine dispatch," sent by the Nicholas Central Physical Observatory to the radio stations at Libau, Riga, and Revel, for the needs of mariners in the Baltic Sea:

The telegram will consist of 20 groups of 5 numerals in each group. Every two groups will give the morning meteorological observations of one station, according to the arrangement, BBBVV SNTTT.

NOTE.—The observations will refer to the morning of the day on which the dispatch is sent—of foreign stations about 8 a. m., mid-European time, and of Russian stations about 7 a. m., local time.

The first three numerals of the first group (BBB) represent the atmospheric pressure reduced to 0° and to the sea level, with tenths of a millimeter, the hundreds (700) being omitted; thus, for example, 620 would indicate 762.0 mm. The following two numerals (VV) give the direction of the wind according to the following table:

02—N.N.E.	10—E.S.E.	20—S.W.	30—N.N.W.
04—N.E.	12—S.E.	22—W.S.W.	32—N.
06—E.N.E.	14—S.S.E.	24—W.	
08—E.	16—S.	26—W.N.W.	
00—Calm.	18—S.S.W.	28—N.W.	

The first numeral of the second group (S) gives the force of the wind according to the Beaufort scale.

Unit of scale.	Meters per second.	Wind.
0.....	0-02	Very slight breeze or calm.
1.....	3-4	Slight.
2.....	5-6	Light.
3.....	7-8	Gentle.
4.....	9-11	Moderate.
5.....	12-13	Fresh.
6.....	14-16	Strong.
7.....	17-18	Moderate gale.
8.....	19-22	Fresh gale.
9.....	23-26	Strong gale.

In the cases of stronger winds the numeral groups for the given station will not be given, but words are used, thus:

“Silni shtorm” (whole gale)—when the wind has a force of 10 (27–31 meters).

“Zhestoki shtorm” (violent gale)—when the wind has a force of 11 (32–36 meters).

“Uragan” (hurricane)—when the wind has a force of 12 (upwards of 36 meters).

If such a wind has been observed at two or more stations, these words will be repeated for each station at the proper place.

The second numeral of the second group (N) gives the quantity of cloud according to the 4-ball system, and the state of the weather at the moment of the observations according to the following table:

0 ---- Cloudless sky.	5 ---- Rain.
1 ---- $\frac{1}{4}$ sky in clouds.	6 ---- Snow.
2 ---- $\frac{1}{2}$ sky in clouds.	7 ---- Smoke, dry fog.
3 ---- $\frac{3}{4}$ sky in clouds.	8 ---- Ordinary fog.
4 ---- The whole sky in clouds.	9 ---- Thundrestorm.

The last three numerals (TTT) give the temperature of the air in degrees Celsius, with tenths of a degree. To indicate a temperature below zero 50 is added.

Example: 62032 46513 means:

Atmospheric pressure-----	762.0 mm.
Direction of wind-----	N.
Velocity of wind-----	4.
State of weather at moment of observa- tion -----	Snow falling.
Temperature of air-----	-1.3° C.

The names of the stations will not be given in the telegrams, since the same order will always be preserved, viz:

- | | |
|-------------------|-----------------|
| 1. Bodö. | 6. Swinemünde. |
| 2. Christiansund. | 7. Libau. |
| 3. Sumburgh head. | 8. Hangö. |
| 4. Shields. | 9. Hernösand. |
| 5. Blaavands huk. | 10. Harparanda. |

In case the observations of any station are not forthcoming, the word “nyet” (none) will be sent instead of the two numeral groups corresponding to that station. If separate elements are absent, such as the atmospheric pressure, nine (9) will be sent in the corresponding places.

A nine in the “force of wind” indicates the absence of observations only in case the “direction of wind” is also absent.

NOTE.—In the event of especially sharp and rapid changes of temperature, and also the appearance of heavy gales, the Nicholas Central Physical Observatory will send special warnings, indicating in words the threatened region, and also the direction and force of the wind and the state of the weather.

Life-saving stations.—On the coasts described in this work there are a large number of places where life-saving appliances are stationed, which are always available in cases of necessity.

On the Danish island of Bornholm, situated at the entrance of the Baltic, there are lifeboat stations at Snogebæk and Rønne, and rocket stations at Allinge, Gudhjem, Svaneke, Snogebæk, Rønne, and Hasle.

On the southeast coast of Sweden both lifeboat and rocket stations are established at Sandhammaren and Utläangan, and at Visby and Flisvik in Gotland; lifeboats only at Gräsgård, Grönhögen, Faludden, and Skårsandeudde in Öland; and rocket stations only at Ystad and Brantevik.

On the German and Russian coasts the lifeboats and rocket stations are very numerous, too many to enumerate here; they are all named in the text at their respective localities and will be found duly noted upon the charts.

Tides.—The difference in the height of the water in the Baltic, as produced by the tide is so small as to be without any influence on practical navigation.

From observations on the German coast the tidal range decreases gradually eastward from Swinemünde, where the range is 0.43 of an inch, to Memel, where the range is 0.19 of an inch.

Simultaneous observations taken at Karlskrona and Stockholm on the Swedish coast and at Helsingfors on the north shore of the Gulf of Finland give a range of 0.98 of an inch.

Caution.—Seamen must not, however, fall into the misapprehension that the tidal range represents the difference of range of water above or below mean water level, for at times the range is considerable and is due to causes other than astronomical.

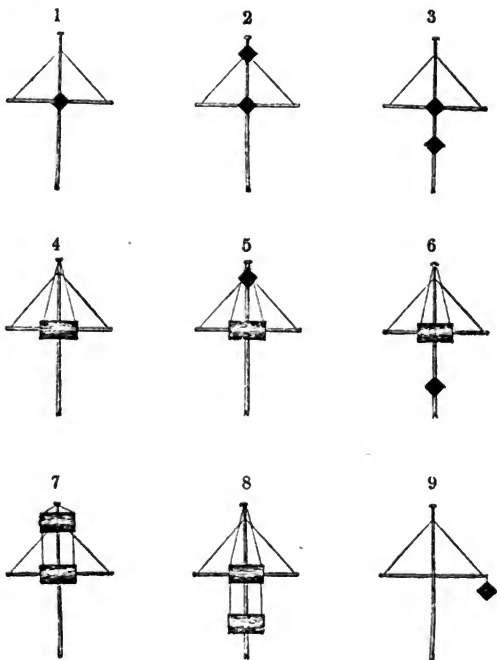
Range of water level.—The variations in the height of the water seem for the most part referable to three different conditions which may operate separately or in conjunction, viz: (1) the seasonal increase and decrease of the amount of water brought down by rivers; (2) the banking up of the outflow or inflow by opposing winds; (3) the variations in atmospheric pressure.

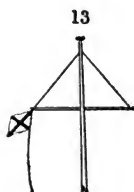
As affecting navigation, a combination of the above mentioned raises or lowers the water of the Baltic Sea about 3 feet from the mean water level. At the heads of inlets it is much more, for instance, at Haparanda, at the head of the Gulf of Bothnia, it may be 5 feet under exceptional circumstances.

Apart from changes due to winds over considerable areas, the waters of the Baltic are subject to alterations of level more or less local, occurring to a varying extent and at irregular intervals.

This movement occurs at all seasons, but is most frequent in the autumn or winter; sometimes the surface rises upwards of 3 feet above mean level, and maintains that height for weeks, though most commonly for a few days over a certain area, occasioning strong eddies and currents at its outskirts. The movement appears wholly due to atmospheric pressure.

Depth signals—German ports.—The following signals indicate the depth of water at the entrance of the ports of the German coast in the Baltic, and are made with diamond shapes, cylinders, a white flag with red cross, and a red pendant; the diagrams are as seen from sea :





No. of signal.	Indication.	No. of signal.	Indication.
1	6 feet 6 inches.	9	4 inches for each diamond shown.
2	9 feet 10 inches.	10	1 foot 8 inches.
3	13 feet 1 inch.	11	2 inches.
4	16 feet 4 inches.	12	The water is rising.
5	19 feet 8 inches.	13	High water.
6	22 feet 11 inches.	14	The water is falling.
7	26 feet 3 inches.	15	Entrance free.
8	29 feet 6 inches.		

Russian coast signals.—The following diagrams (Tables I and II) show the system of uniform signals made from the Russian ports of the Baltic, giving depth on the bar at the entrance, and directions for the channel into harbor; at Petrograd and in the Finland fjärds there are certain exceptions.

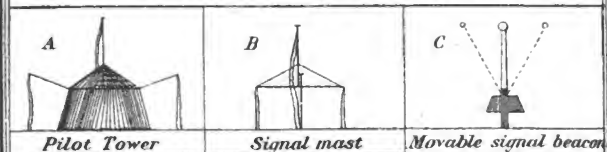
The signals are hoisted at the side flag poles on pilot towers (fig. A), where such exist, or at the yardarms of the signal masts (fig. B). Balls, flags, and pendants are used without distinction of color, those being selected which can best be seen from seawards, according to the locality.

RUSSIAN SIGNALS

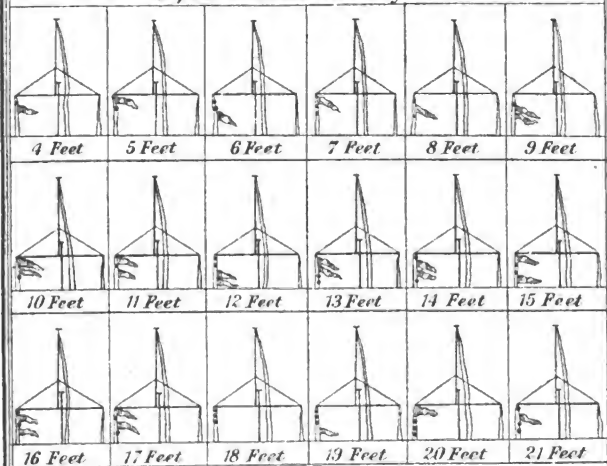
TABLE I

Signals indicating depths of water

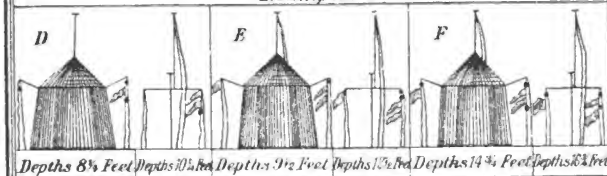
These are hoisted on flagstuffs at the sides of the Pilot tower (A) or on the yard of the signal mast (B)



Depths in Russian or English feet



One ball - $\frac{1}{4}$ foot; One flag - $\frac{1}{2}$ foot; One ball and one flag - $\frac{3}{4}$ foot, when hoisted at the opposite yard arm to the above signals
Examples



RUSSIAN SIGNALS

TABLE II

Special Signals

*These are hoisted on the middle flag staff (Fig A, Table I)
or at the signal mast head (Fig B, Table I)*

Nº	Meaning of the Signal	Nº	Meaning of the Signal
1	 The pilot has gone to meet the ship	12	 Anchor in the roadstead
2	 No pilot there or cannot go out	13	 Put to sea
3	 Entrance impossible	14	 The pilot is proceeding to the nearest ship
4	 Storm expected	15	 Send a boat on shore
5	 The current is from the right side	16	 Beginning of Slack water
6	 The current is from the left side		
<i>The right side is that looking from the ship when heading towards the Signal station and the left side that to the left of the Station</i>			17	End of Slack water
7	 No current or high water	18	 Put the vessel ashore on the right (starboard) side entering
8	 How many feet does the ship draw <i>Note: To be answered by the ship by signals in table I</i>	19	 Put the vessel ashore on the left (port) side entering
9	 The entrance to the harbour is beset with ice	20	 The pilot is to go on shore
10	 Ice drifting out of the harbour	21	 The buoys are in position
11	 Enter the harbour	22	 The buoys are not in position

The "direction beacon" (fig. C) indicates the course to a vessel coming in when a pilot can not get out to her, or when circumstances compel a vessel to enter the port without one. This beacon consists of a mast which turns on a pivot, and which can be kept vertical, or may be inclined as required to either side, directing the vessel to steer more toward that side of the channel to which the beacon is inclined. All signals made should be registered.

At every pilot station there is a small flagstaff for showing these signals; they are made, however, at the lighthouse building when there is one.

Signals having a special meaning (Table II) are hoisted on the middle (vertical) flagstaff of the pilot tower (A), or on the summit of the signal mast (B); signals indicating depth of water are hoisted at the side flagstaffs of the pilot tower, or at the yardarms of the signal mast. (See Tables I and II.)

Distress signals.—When a vessel is in distress and requires assistance from other vessels or from the shore, the following shall be the signals to be used or displayed by her, either together or separately, viz:

By day: (1) A gun fired at intervals of about a minute. (2) The distress signal "NC" of the International Code. (3) The distant signal, consisting of a square flag, with a ball or some similar object either above or below it. (4) A continuous sounding with any fog-signal apparatus.

By night: (1) A gun or other explosive signal fired at intervals of about a minute. (2) Flames on the vessel (as from a burning tar barrel, oil barrel, etc.). (3) Rockets or shells, throwing stars of any color or description, fired one at a time at short intervals. (4) A continuous sounding with any fog-signal apparatus.

The radio call, for vessels in distress, by the Morse system is . . . — — — . . . (S O S), which should be repeated at short intervals until an answer is received.

Caution—Abnormal magnetic variations.—The magnetic conditions found over the area covered by this volume appear, from numerous reports, to be of a most disturbed character, and great caution should always be exercised when near the land or in comparatively shallow water. (See Index chart.)

With the exception of the Bornholm area, no systematic magnetic survey has yet been undertaken: it is therefore impossible to furnish any detailed information.

Currents.—In the navigation of the Baltic the set of the currents (from causes hereafter explained) is a much more important matter than seamen unacquainted with that sea would be disposed to credit; but the fact remains that from their nature they require from him constant watchfulness and forethought.

To deal, firstly, with the general movement of the surface. The great volume of water poured into this sea from many rivers and the comparatively slight evaporation causes a uniform set toward the outlets at the Sound and Belts into the Kattegat, otherwise a general set in a southerly and westerly direction toward those outlets. This movement, however, is subject to great variation in different localities from the influence of the wind and atmospheric pressure.

The southerly set out of the Gulf of Bothnia, joining the westerly set out of the Gulf of Finland, flow together down the Swedish coast between Gotland and Öland, with a branch through Kalmar Sound and another between Gotland and the Kourland coast; these again unite and set west-southwest on both sides of Bornholm toward the Belts.

The above is the normal movement of the surface water in calm weather; but there are other causes at work.

The current generally sets with the wind from 1 to 2 knots per hour in the open sea and from 3 to 4 knots per hour near the shore during gales. This is particularly the case in Kalmar Sound and on the German coast, where the current at times precedes a gale by several hours.

Again, atmospheric pressure raises the level of the water over certain areas for long or short periods causing at its outskirts strong currents and eddies very confusing to seamen.

An undercurrent of saltier, and therefore heavier, water enters through the Belts and can be distinctly traced over a great part of the Baltic, more especially along the south and east shores as far as Ösel, thence rounding Gotska Sandön, and flowing southward, after which all traces of it are lost.

Ice.—On account of the many fresh waters emptying into the Baltic Sea, the salinity is only about 1 per cent, and consequently it freezes at -0.7 Celsius, or about 30° F. Ice often begins to form first at the bottom, and is frequently brought up in fishermen's nets from depths of 10 to 15 fathoms, while the surface is still clear.

Yearly the Gulf of Bothnia, water in vicinity of the Finnish Islands, around the Aland Islands, in the eastern part of Gulf of Finland, in channels of Moonsound, and in portions of Gulf of Riga freezes over so as to prevent all navigation, and remains so frozen from four to six months. Along the Swedish shore the water freezes usually as far as Stockholm, but the winter temperatures on this shore are milder than on the Russian coast. To southward of the line between entrance to Gulf of Riga and island of Gotland the Baltic rarely, if ever, freezes.

On approach of winter the canals in northern Russia begin to freeze about 12 days after the mean temperature for 24 hours becomes less than 32° F. Five days later the smaller rivers and lakes begin

to freeze and about a week later the larger rivers. About the beginning of December all inland waterways are frozen over.

In the Baltic freezing begins in the northeastern part of the Gulf of Bothnia usually in beginning of November, and by middle of that month this part of the Baltic is frozen over as far as Nikolaistadt. The ice then extends down along the western Finnish shore toward Raumo. In beginning of December ice covers the coast islands between Bierke and Svarte-Kruke and thence as far as Helsingfors. By the middle of December all ports on the southwestern shore of Finland are closed by ice, and by the end of December the Aland Islands are also inclosed.

In the Gulf of Finland it is usually frozen over from the mouth of the Neva to the island of Gotland and along both southern and northern shores as far as the entrance. This begins on an average between the beginning and middle of December, and by the end of January the eastern part of the gulf is completely frozen over. In severe winters the entire gulf freezes over as far as its entrance. This year the Neva froze over about December 1, Kronstadt was frozen up by the middle of December, and the entire gulf is now closed (January 24).

The passages between the islands Dago, Esel, Borms Moon, and Moonsound begin to freeze over about the middle of November and more open places being covered about the middle of January. Along the western shores of these islands fixed ice occurs only in severe winters and lasts only 20 to 40 days.

Riga Gulf very rarely freezes completely over, but usually ice makes out from the shores for $1\frac{1}{2}$ to 2 miles. In severe winters the gulf may freeze over. This winter is considered a severe one and, though it is not known, still it is thought that the gulf and the entrance are frozen over.

Fixed ice very rarely occurs at the ports of Libau and Windau, and then only in severe winters and for a very short time. For navigational purposes these ports may be considered as ice free.

On approach of spring the clearing of the Baltic proceeds in reverse order. About the middle of March clearing of ice begins in the Gulf of Riga and in the channels leading from it to the Moonsound and between the islands to the Gulf of Finland. At the end of March the western part of the Gulf of Finland, except close along the northern shore, begins to clear. In the first part of April ice starts away from the Aland Islands, and by the end of the month these islands and the Gulf of Finland are clear. Toward the end of April the western shores of Finland and Gulf of Bothnia begin to clear. It is usually not until the beginning of June that the Gulf of Bothnia is entirely clear. Generally the clearing begins about the middle of March at the point of entrance to the Gulf of Finland

and then proceeds in an easterly and northerly direction, much more quickly in the former than in the latter.

All ports in the Gulf of Finland are blocked by ice from about the 1st of January until the 1st of April. However, ice breakers have little difficulty in keeping channels to open water from these ports with which it may be particularly desirable to have communication. Ice in the Gulf of Finland varies in thickness from 9 inches to 3 feet. Even through the latter, the heavy ice breakers go at speeds of 6 to 8 knots. However, if the ice should be covered with snow, this banks up against the side of the ice breaker and very much slows the speed, and occasionally prevents the ice breaker from working successfully, when if there had been no snow there would have been little difficulty in getting through the ice.

The floating seamarks, including light vessels, are usually laid out in March and April, and replaced, in certain places only, by winter marks in November and December. The light vessels are removed when they are liable to injury from ice, and no dependence can be placed on finding any floating seamarks in winter.

The winter of the year of 1892-93 was one of great severity. Libau was closed to navigation from January 16 to March 18; so long a duration of ice is very exceptional at this port. Ten steam vessels making for the port were drifted northward in the ice to Stein Ort, and wintered in the ice at 6 miles westward of Domesness.

In mild winters communication is maintained regularly by steam vessels between Stockholm and Hangö, the vessel forcing her way through the ice in the narrow channels leading to Stockholm without difficulty.

Ice signals.—In order to give the mariner the earliest possible information as to the state and condition of the ice he may have to encounter in the passage between the North Sea and Baltic, and vice versa, as well as the amount of assistance he may expect to derive from the various light vessels, buoys, etc., being in position, a system of ice signals has been established.

Ice signals will not be shown from light vessels or ice-signal stations until navigation is closed for sailing vessels.

"Ice in fairway" signifies, therefore, that navigation is closed for sailing vessels.

"Blocked by ice" signifies that navigation is closed for sailing vessels and steamships, but not necessarily for ice breakers.

The principal station for vessels outward bound from the Baltic is at Hammer odde, Bornholm, where they are given in accordance with the Danish system. Such signals are only intended to give the mariner a general warning not to attempt the channel with respect to which the signal is made, unless prepared to meet with ice.

An opinion as to the condition of the ice in any locality can be formed from the signals showing that certain light vessels or light buoys have been withdrawn from their stations, the rule being that as the ice increases the light buoys are first withdrawn and then the light vessels.

The light vessels are retained at their stations generally as long as a steamer of ordinary power can navigate the channels. When any light vessel is withdrawn it signifies that heavy ice is forming in the locality, and all the light vessels in a channel are withdrawn when the navigation of such channel, although perhaps possible, could only be attempted with great risk.

When the ice breaks up and drifts away it should be borne in mind that the channels may be navigable without risk from ice before it has been possible to replace all the light vessels.

Swedish ice signals.—Falsterbo Udde. A black cone is hoisted as a signal at the gaff of the aftermast of Falsterbo Reef light vessel, and a black cone at Ölands Södra Udde lighthouse whenever ice necessitates the temporary withdrawal of Alma grundet light vessel. Ice signals are exhibited at Ölands Södra Udde, Ölands Norra Udde, and Landsort, and ice and light vessel signals at Söderarm and Hufvudskär lighthouses.

Information with regard to the condition of the ice in the entrances to the principal harbors on the coasts of Sweden, and in certain of the channels leading into the Baltic, is posted up daily during the winter at the undermentioned places: Stockholm, at Skeppsbron telegraph office and at the pilot captain's office; Malmö, at the pilot station and harbor captain's office; Göteborg, at the pilot captain's office.

German coast ice signals.—When passing certain lighthouses and signal stations on the German coast information may be obtained from them by signal as to the condition of the ice on the German Baltic coast, in the Kaiser Wilhelm Canal, and in the Danish waters. The lighthouses are: Cape Arkona, Rixhöft, and Brüster Ort.

From the beginning to the close of the ice period daily official telegraphic reports upon the ice condition in the German coastal waters will be published daily, except on Sundays and holidays. The reports upon the German Baltic coast will also contain notices as to the Danish coastal waters, and can be obtained from the post or telegraph offices. The fee, to be paid in advance, is 20 marks.

In addition, the official ice reports will be issued at the collecting stations, if called for, free of charge.

Russian coast ice signals.—Ice signals are made at Lyser Ort Lighthouse when ice is seen from neighboring lighthouses, and at

North Ristna Lighthouse, day and night, when there is ice in the Gulf of Finland.

Caution—Floating seamarks removed in winter.—As previously stated, on the close of navigation in the autumn in consequence of ice the lightvessels, buoys, and such beacons as are liable to injury are removed, and in some localities the buoys are replaced by temporary seamarks.

On the opening of navigation in the spring the summer marks are again placed in position, those marking main fairways for shipping being laid out first.

Opening and closing of Baltic ports.—The following table shows the earliest and latest dates recorded during several years of the opening and closing of some of the principal ports in the Baltic:

Place.	Opening.		Closing.		Remarks.
	Earliest.	Latest.	Earliest.	Latest.	
Greifswald Bodden.	Jan. 1, 1863	Apr. 1, 1875 and 1881.	Dec. 2, 1879	Dec. 31, 1873	Between 1860 and 1881.
Stettin.....	Feb. 23, 1878	Apr. 13, 1881	Nov. 27, 1879	Jan. 5, 1881	Between 1870 and 1881.
Neufahrwasser...	Jan. 21, 1819	Apr. 12, 1845	Nov. 21, 1829, 1834, 1838.	Jan. 29, 1823	Between 1815 and 1849.
Königsberg.....	Mar. 25, 1876	Apr. 13, 1881	Nov. 8, 1876	Dec. 22, 1877	Between 1876 and 1881.
Memel.....	Mar. 22, 1869	Apr. 24, 1871	Oct. 24, 1880	Dec. 15, 1878	Between 1860 and 1880.
Gulf of Riga.....	Mar. 8, 1910		Feb. 24, 1885		
Do.....	May 2, 1888				
Stockholm.....		Apr. 25, 1889		Feb. 11, 1889	

Table showing the average ice conditions at certain stations on the German coast of the Baltic, from the observations of 8 years, from the winter of 1903-4 to 1910-11.

[Berlin Annalen, 1911.]

Station.	Number of days on which ice may be expected.	Number of days on which sailing vessels were impeded.	Number of days on which navigation was closed for sailing vessels.	Number of days on which navigation was closed for steamers.	First report of ice.	Last report of ice.
Arkona.....	4.5	1.9	0.2	0	Jan. 25, 1909	Mar. 27, 1909
Thiessow.....	43.4	7.6	13.0	16.2	Nov. 16, 1908	Apr. 8, 1909
Greifswald Oie.....	18.8	2.0	6.9	0	Dec. 22, 1906	Apr. 2, 1909
Stettiner Hafl to Stettin.....	61.2	19.0	38.6	0.5	Nov. 16, 1908	Do.
Swinemünde Hafen.....	53.2	16.3	11.2	0	Nov. 17, 1908	Apr. 4, 1909
Kollberg Hafen.....	15.8	5.1	1.2	0.4	Nov. 11, 1910	Mar. 18, 1909
Stolpmünde.....	16.2	8.6	0.6	0	Dec. 3, 1907	Mar. 8, 1909
Rixhöft.....	5.0	0.1	0	0	Jan. 4, 1906	Mar. 2, 1909
Hela.....	5.6	0.2	0	0	Jan. 2, 1909	Do.
Neufahrwasser to Danzig.....	36.8	15.0	10.9	0.1	Nov. 16, 1908	Mar. 26, 1909
Frische Hafl to Elbing.....	94.0	7.7	17.0	63.1	Nov. 12, 1908	Apr. 6, 1909
Frische Hafl to Königsberg.....	112.8	32.7	58.5	21.9	Nov. 13, 1908	Apr. 14, 1909
Pillau Revier.....	32.0	2.9	12.3	0	Nov. 14, 1908	Apr. 4, 1909
Pillau Hafen.....	68.8	12.9	12.9	0	Nov. 13, 1908	Apr. 9, 1909
Brüster Ort.....	11.0	5.0	0	0	Dec. 28, 1908	Apr. 13, 1909
Memel Revier.....	64.8	23.8	7.0	4.9	Nov. 14, 1908	Do.
Memel See.....	20.2	5.0	0.6	0.1	Oct. 25, 1909	Mar. 14, 1907

During the period mentioned above, ice breakers were at work at Swinemünde, Danzig, Pillau, and Memel. The winter of 1908-9 was very severe.

Ice breakers.—The conditions of winter navigation in the Baltic are now being modified by the gradual introduction of ice breakers. They may be said to be of two kinds: Those designed for the purpose of keeping a port open by constantly passing up and down the channel liable to be frozen, and those for the navigation of waters lightly frozen over.

They are very strongly built vessels with a spoon bow, and break the ice partly by impact and partly by crushing it under this bow, and have proved to be very efficient. In January and February, 1892, one of these, the *Murtaja*, cleared a path without stopping, through a sheet of ice 30 inches thick.

The ice breakers have proved that they are of enormous value to the shipping of the ports of Swinemünde and Stettin.

The mails between Stockholm and Hangö in Finland are, during winter, now carried on by one of these vessels.

Regulations for vessels conducted through ice by Russian ice breakers, see Appendix III.

Signal stations.—The following signal stations are established on the Baltic coasts described in this work, in communicating with which the international code of signals should be used. All German signal stations are connected with a telegraph office.

Name of station.	Latitude north (approximate).	Longitude east (approximate).	Remarks.
	° ' "	° ' "	
Steplebjerg.....	55 17 00	14 46 00	Telegraph station.
Cape Arkona.....	54 41 00	13 26 00	In connection with the German telegraph system.
Thiessow.....	54 16 30	13 43 00	
Ruden Island.....	54 12 30	13 46 30	
Stolpmünde.....	54 35 00	16 52 00	
Rixgöft.....	54 50 00	18 20 30	Do.
Neufahrwasser.....	54 24 30	18 40 00	Do.
Brüster Ort.....	54 58 00	19 59 00	Do.
Nidden.....	55 19 00	21 0 00	Do.
Memel.....	55 43 00	21 7 00	
Libau Pilot Tower.....	56 31 00	21 1 00	Semaphore station. Telephone at lighthouse.
Windau Signal Tower.....	57 24 00	21 34 00	Telephone and telegraph station.
Lyser Ort Light.....	57 34 00	21 44 00	Telegraph, semaphore, and telephone station.
Domesness Light.....	57 48 00	22 39 00	Do.
Ust Dvinski.....	57 3 00	24 2 00	Telegraph station.
Pernau Light.....	58 23 00	24 31 00	Do.
North Ristna Point....	58 55 00	22 13 00	Semaphore and telephone station.

The following are telegraph stations only: Swalfer Ort Light-house; Kertel Harbor, on Dagö; Kuivast on east coast of Möön and Werder Island Light.

Communication.—**Submarine telegraph cables** are laid between the following places in the Baltic within the limits of this book: Hellehaven Point, Möen, to Bornholm; Bornholm to Libau; Stafstens Udde to Cape Arkona; Skägganäs, Sweden, to Öland; Engerne Udde, Öland, to Skans Udde, Gotland; Gotland with Sandö, Örnö, and Dalarö, Sweden; Dagö to Ösel; Ösel to Möön; Möön to Werder; Libau to Kronstadt; Libau to Denmark.

Caution.—Mariners are cautioned against fouling the submarine cables by anchoring in their vicinity. Directions and warnings given by pilots, customhouse officers, or other Government officials should be carefully attended to and complied with; any damage caused to the cables, either willfully or carelessly, rendering the offender liable to heavy penalties.

Telegraphs.—All the coast towns of the Baltic are connected by telegraph lines and thus with all parts of the world embraced by the telegraphic system.

The following telegraph offices on the coast are always open:

Sweden.—Stockholm.

Germany.—Danzig, Greifswald, Kolberg, Königsberg, Memel, Pillau, Stettin, Stralsund, Swinemünde, and Wolgast.

Russia.—Arensburg, Domesness, Hapsal, Kertel, Libau, Lyser Ort, Pernau, Riga, and Windau.

The following offices are open till midnight:

Germany.—Ziunowitz (summer only).

Radio stations are established at Karlskrona, Danzig, Libau, Sassnitz, Swinemünde, Riga, and Runö.

In cases of distress only communication may be made with the station at Adler Grund Light Vessel.

Government dockyards.—There are Government dockyards at Karlskrona and Stockholm, in Sweden; at Danzig, in Germany; and at Libau, in Russia.

Docks.—Within the limits of this work there are docks at the following ports: In Bornholm, a graving dock at Nexö. In Sweden, Government graving docks at Karlskrona and Stockholm; private docks at Solvesborg, Oskarshamn, and Norrköping. At Stockholm there is also a floating dock.

In Germany there is an imperial floating dock at Danzig and a torpedo boat dock at Elbing; there are also floating docks at Pillau, Danzig, Swinemünde, and Stettin.

In Russia there are Government graving docks at Libau; also a Government floating dock at Libau and private floating docks at Riga.

Patent slips.—In Sweden, at Ystad, Karlshamn, Karlskrona (Government torpedo-boat slip), Kalmar, Västervik, Visby (Gotland), Stockholm, and Furusund.

In Germany, at Stralsund, Wolgast, Anklam, Swinemünde, Stettin, Kolberg, Danzig, and Memel (Government and private).

In Russia, at Riga.

For particulars of docks and patent slips, see Appendix I.

Standard time.—The standard time kept in Denmark, Sweden, and Germany is mid-European time, viz, that of the meridian of longitude 15° E., or one hour in advance of Greenwich mean time. In

western Russia the time kept is that of the meridian of Pulkowa, or 2 h. 1 m. 18.6 s. in advance of Greenwich mean time.

Time signals, by which vessels can ascertain the errors of their chronometers, are made in the usual manner, viz, by the dropping of a ball at Karlskrona and at Stockholm in Sweden; at Rönne in Bornholm; at Swinemünde, Stettin, and at Neufahrwasser in Germany; and at Libau and Riga in Russia. For particulars, see under the respective ports.

Steam communication—Swedish shore.—During the navigable season communication is maintained by steamers from Ystad to Stockholm, Lübeck, Copenhagen, and Rönne in Bornholm. Karlskrona is in communication by steamer with all Swedish ports, Norway, Copenhagen, Königsberg, Lübeck, and Swinemünde. Steamers leave Kalmar two or three times weekly for Oskarshamn, Vestervik, Stockholm, Norrköping, and Lübeck; once weekly for Copenhagen, calling at Karlskrona, Åhus Ystad, Malmö, Landskrona, Helsingborg, and Göteborg.

From Vestervik there is communication by steamers twice weekly to Norrköping, Oskarshamn, Mönsterås, Borgholm, Kalmar, and Stockholm; these vessels on the return voyage from Stockholm proceed southward and around the coast as far as Landskrona. During the winter the mails are dispatched from Vestervik to Visby on Gotland Island by an ice-breaking steamer.

During the summer steamers leave Stockholm twice weekly for Lübeck; three times weekly for Visby, Åbö, Hangö, Helsingfors, and Petrograd. Sundsvall, during the summer, has regular steam communication with Stockholm, Vasa, Kaskö, Göteborg, Copenhagen, London, Lübeck, and Stettin. Hernösand has steam communication between Finland, Denmark, and Swedish ports. There are two lines of steamers running weekly during the navigable season between Stockholm and Haparanda, at the head of the Gulf of Bothnia, touching at several intermediate ports.

Lines of Swedish steamers run to Brazil and River Plate, Australia, South Africa, and East Asia.

German shore.—During the summer, steamers leave Stralsund for Malmö three times weekly. From Stettin and Swinemünde there is steam communication to all the important Baltic ports, also to London, Hull, Newcastle, and Leith. Steamers leave Stettin once weekly for Copenhagen; twice weekly for Memel, Königsberg, Petrograd, Lauterbach, and Sassnitz. A steamer leaves Stettin for Stockholm once a fortnight from midsummer till the end of October. Steamers leave Danzig twice weekly for Königsberg, Pillau, Stettin, Neufahrwasser, and Swinemünde.

From Memel there is communication by steamer to the important ports of England and other countries throughout the year: four

times weekly to Stettin, and by river to Tilsit, Labiau, and Königsberg.

Russian shore.—There are regular lines of steamers between Libau, Belgium, Holland, and England. From Windau there is communication to Libau, Revel, Riga, and Petrograd. Riga has regular communication by steamer with Petrograd, Revel, Port Baltic, Arensburg, Pernau, Windau, Libau, Stettin, Lübeck, London, Hull, Leith, and Belfast.

There is regular communication by steamer during the summer between Port Baltic, Hapsal, Arensburg, and Riga; also between Petrograd, Riga, and Libau.

Railways—Sweden.—The Swedish railways extend (December, 1909) over distances measuring together 8,458 miles, of which 2,717 miles belong to the State and the remainder to private companies. The State railways include nearly all the main lines; the western between Stockholm and Göteborg; the southern from Katrineholm to Malmö; the northern from Stockholm to Upsala, Östersund, and the frontier of Norway, thence to the Atlantic at Trondhjem; the eastern from Stockholm to Norrköping, Linköping, and Nässjö; and the northwestern from Laxå to the frontier of Norway.

Ystad is connected by railway with Malmö, Landskrona, Helsingborg, and other towns on the southwest coast, and with Jonköping; and to Oskarshamn from the main line at Nässjö. Karlskrona is also connected with the main line at Wexjö and by branch to Kalmar.

From Norrköping there are branches to Vestervik and Oskarshamn, and a main line to Stockholm.

From the main line between Stockholm and Östersund there are branches to Gefle and Sundsvall; from Bräcke a line continues north-eastward to Luleå and the Finland border; from Luleå it turns northward and passes through Gällivare to the frontier of Norway, whence it reaches the Atlantic at Ofoten fjärd.

Germany.—Stralsund is in communication by rail with Bergen on Rügen Island, Greifswald, Swinemünde, Stettin, Kolberg, Stolpmünde, Königsberg, Pillau, and Memel; a line runs through the island of Wollin, from Swinemünde, which is a direct continuation of the Oder Railway to Silesia. All ports are connected by branch railways with the main line to Berlin; there is also a direct line from Stralsund to Berlin, via Neustrelitz; and from Stolpmünde to Posen Junction, thence to Frankfurt and Berlin. From Königsberg there is a direct line to Eydtkuhnen, on the Prussian frontier, thence via Kowno and Dünaberg to Petrograd.

Russia.—Riga is connected by railway with Petrograd (via Dünaberg), Mitau, Libau, Tukum Hill, and Windau, with branch lines to Dünaburg and Myulgraben.

Weights and measures, money.—Sweden and Germany adopt the metric system of weights and measures.

Swedish currency is very simple, consisting of kroner and öres.

Gold coin, 20 kroner, equals \$5.37.

Gold coin, 10 kroner, equals \$2.685.

Silver coin, 4 kroner, equals \$1.074.

Silver coin, 2 kroner, equals \$0.537.

Silver coin, 1 kroner (100 öres), equals \$0.268.

Silver coin, 50 öres, equals \$0.139.

Silver coin, 25 öres, equals \$0.069.

Silver coin, 10 öres, equals \$0.028.

Copper coins, 5 öres, 2 öres, and 1 öre. 1 öre equals \$0.0028.

Paper money is principally used; least value, 5 kroner.

German currency.—The establishment of the German Empire led to a uniform decimal monetary system, as follows:

Gold coin, 20 marks (doppel krone), equals \$4.76.

Gold coin, 10 marks (krone), equals \$2.38.

Gold coin, 5 marks, equals \$1.215.

Silver coin, 5 marks, equals \$1.19.

Silver coin, 3 marks (thaler), equals \$0.714.

Silver coin, 2 marks, equals \$0.476.

Silver coin, 1 mark (100 pfennigs), equals \$0.238.

Silver coin, $\frac{1}{2}$ mark (50 pfennigs), equals \$0.119.

Nickel coin, 10 pfennigs, equals \$0.024.

Nickel coin, 5 pfennigs, equals \$0.012.

Bronze coins, 2 and 1 pfennig.

Russian measures are as follows:

LENGTH.

1 diuin equals 1 inch.	500 sagues (1 verst) equals 0.66 statute mle.
12 diuin equals 1 foot.	1 square archine equals 5.44 square feet.
1 vershok equals 1.75 inches.	1 square verst equals 0.44 square mile.
16 vershok (1 archine) equals 28 inches.	1 dessiatin equals 2.7 acres.
3 archines (1 sagine) equals 7 feet.	1 morga equals 1.3 acres.

NOTE.—A nautical sagine is 6 feet.

CAPACITY.

1 chetvert equals 5.77 bushels.	1 vedro equals 2.7 gallons.
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WEIGHT.

1 zolotnik equals 2.41 drams avoirdupois.

1 lot equals 0.45 ounces avoirdupois.

32 lots (1 funt) equals 14.43 ounces avoirdupois.

40 Russian pounds (1 pud) equals 36.113 pounds avoirdupois.

10 puds (1 berkovets) equals 361.13 pounds avoirdupois.

62 puds equals 1 ton.

1 Russian pound equals 0.9028 pound avoirdupois, or 14.45 ounces.

1 centner equals 100 pounds avoirdupois.

1 korzec equals 216 pounds avoirdupois.

Russian currency is decimal, thus: 100 copecks equals 1 ruble (\$0.515).

CHAPTER II.

THE COAST OF SWEDEN FROM FALSTERBO POINT TO KALMAR SOUND, WITH BORNHOLM AND CHRISTIANSO.

Approaches to the Baltic.—A description of and sailing directions for the approaches to the Baltic is given in H. O. No. 141, Scandinavia Pilot, but it may be useful to herein state the navigable depths in the channels.

The Kattegat communicates with the Baltic by three channels, viz, the Great Belt in the center, the Little Belt on the western side, and the Sound on the eastern side. The Great and Little Belts, the channels on either side of the island of Tyen, unite southward of that island and then communicate with the Baltic Sea through the Femern Belt and Cadet Channel. The Sound, passing between the Danish Island of Zealand and the Swedish coast, is the shortest and most direct route, but is too shallow at its southern end for ships of the deepest draft. At its southern end the Sound is divided by the island of Saltholm into two navigable passages, known as the Flint and Drogden Rännen.

Navigable depths.—The Great Belt is the best route, to or from the Baltic, for a fleet or for steamships of more than 23 feet draft. In this channel, with careful pilotage, the least depth that need be passed over is 6 fathoms.

The Little Belt is in places both narrow and tortuous, but a depth of 6 fathoms can be maintained throughout by careful pilotage.

The Sound, owing to the shallows southward of Copenhagen, affords a passage into the Baltic for ships of only 23 feet draft and under.

The Flint Rännan is available for vessels drawing $23\frac{1}{2}$ feet, both by night and day. The Drogden Channel has a depth of 24 feet, but there is a $3\frac{1}{4}$ -fathom shoal in mid-channel.

The Drogden Channel is buoyed on the Danish system, and the Flint Rännan on the Swedish system.

The depth in the Kaiser Wilhelm Canal is 29 feet below mean water level, and may be navigated day and night by vessels not exceeding 26 feet draft.

Falsterbo Point.—Falsterbo Point, the southwest point of Sweden and of the Skanör Peninsula may be recognized by its town,

lighthouse, and church, the latter, however, being obscured by trees from some directions; thence the coast extends in an easterly direction 46 miles to Sandhammar Point, and though generally flat for some distance eastward shows some small elevations and several detached plantations, particularly on approaching Ystad, where the coast is somewhat higher. There are several churches near this coast, which, however (with the exceptions of Trelleborg and Gislöf) do not form good landmarks for strangers.

Kåseberg Head, situated $42\frac{1}{2}$ miles eastward of Falsterbo Point, rises above the general outline; it is flat-topped and has a barren appearance, steep and white toward the sea, and with its westerly and easterly continuations, Hammar Hills and Lyng-biarn, it forms a good landmark; eastward of this head the land decreases in height to beyond Sandhammar Point. Romele Klint, a hill situated 17 miles northeastward of Trelleborg, is one of the most conspicuous landmarks on this part of the coast, especially when seen from the southward; it has two mounds, the eastern of which is the higher and joins a low range of hills of a blue appearance extending eastward.

Light.—On Falsterbo Point stands a yellowish-gray tower, with black band on upper part, lower part square, upper cylindrical, 82 feet high, from which, at an elevation of 78 feet above the sea, is exhibited an occulting white light visible 14 miles in clear weather.

(For details see Light List.)

Vessels can communicate with Falsterbo Lighthouse by means of the international code.

Ice signals—Falsterbo Point.—The ice signals at Falsterbo Point are made by the means of black balls and a cone hoisted on a signal mast southwestward of the lighthouse, the yard having a north-northeast and south-southwest direction; the signals are as follows:

A black ball at northern yard-arm of signal mast: Ice in Flint Rännan.

A black ball at masthead of signal mast: Ice in Drogden Channel.

A black ball at southern yard-arm of signal mast: Ice eastward of Hven Island.

A black ball on mast below yard: Ice westward of Hven Island.

An inverted cone on mast below yard: Ice in southern entrance to Great Belt.

Light vessels.—The signals at Falsterbo Point respecting light-vessels are made by means of black balls and red lights placed as described, and are as follows:

A black ball hoisted under a spar on northern side of lighthouse gallery: Light vessels in Flint Rännan withdrawn.

A black ball hoisted under a spar on southern side of lighthouse gallery: Drogden Light Vessel withdrawn.

By night:

A red light shown from northern side of roof of lower part of lighthouse: Light vessels in Flint Rännan withdrawn.

A red light shown from southern side of roof of lower part of lighthouse: Drogden Light Vessel withdrawn.

Beacon.—A brown mast beacon, 28 feet in height and surmounted with a white circular top mark, is situated near the shore at the distance of 800 yards 73° from Falsterbo Church.

Falsterbo Reef—Buoys.—Falsterbo Reef is flat and extends about $4\frac{1}{2}$ miles from Falsterbo Point in a southerly direction, with numerous rocks on which there are only from 4 to 14 feet water. The bottom is generally rock, but about 1 mile south from the point there is a dry sandy cay named Måkläppen. Off the western side of the reef, about 1 mile westward of Måkläppen, in a depth of about $3\frac{1}{2}$ fathoms, there is a red spar buoy with one down-turned broom and about $3\frac{3}{4}$ miles 213° from Falsterbo Lighthouse there is a red buoy surmounted by two down-turned brooms. A wreck lies sunk in $4\frac{1}{2}$ fathoms 3 miles 260° from Falsterbo Lighthouse.

At the south extreme of Falsterbo Reef is Hilda Grund, a rock with $1\frac{1}{2}$ fathoms water over it, marked by a red spar buoy, surmounted with a ball under an upturned broom, lying over $\frac{1}{2}$ mile southwestward from it, and a shoal of $3\frac{3}{4}$ fathoms lying 1 mile east-southeastward of Hilda Grund, is marked by a red spar buoy with three upturned brooms. About $2\frac{3}{4}$ miles east-northeastward from Hilda Grund Rock lies Highbury Grund, a shoal with $2\frac{1}{2}$ fathoms, with another of $3\frac{3}{4}$ fathoms $\frac{3}{4}$ mile southeastward of it, the latter marked on its south side by a red spar buoy, with ball over upturned broom. A shoal of $4\frac{1}{2}$ fathoms lies 5 miles 184° and another of $4\frac{1}{2}$ fathoms 5.6 miles 185° from Falsterbo Lighthouse.

In the area within the above buoys and Blinda Segelskär several shoals are reported.

Light vessel.¹—Falsterbo Reef Light Vessel, moored in a depth of 6 fathoms, about $1\frac{1}{4}$ miles southwestward of Hilda Grund and 5 $\frac{1}{2}$ miles 191° from Falsterbo Lighthouse, is painted red, with Falsterboref on sides; it has a tower and a jigger mast, and exhibits, at an elevation of 33 feet above the sea, a group flashing white light, visible 11 miles. (For details see Light List.)

¹ Wreck signals.—A signal consisting of two green balls or two lanterns showing fixed green lights, hoisted on Falsterbo Light Vessel, signifies "Wreck in northern entrance to sound, or in the sound north of parallel of Middlegrund Fort; exercise caution."

A signal consisting of three green balls or three fixed green lights at the light vessel signifies "Wreck in the sound south of parallel of Middlegrund Fort; exercise care."

Fog signal.—During thick or foggy weather a siren is sounded.

If the siren is out of order the signal will be made with a bell.

When ice necessitates the temporary withdrawal of Almagrund Light Vessel, the fact of her being withdrawn will be signalled from this light vessel by the hoisting of a black cone, point upwards, under the gaff.

Current.—Near Falsterbo Reef Light Vessel the current usually sets either to the eastward or westward, following the direction of the south coast of Sweden.

Pilots can be obtained from the Falsterbo Reef Light Vessel and from a pilot cutter or steamer anchored in the fairway between the Falsterbo and Drogden Light Vessels. The light vessel will fly the pilot flag by day, and at night hoist a white light to the gaff to show that a pilot is on board. The pilot cutter or steamer will hoist a flag by day or light at night at the masthead to signify a pilot is on board.

Wreck.—A wreck, over which there is a depth of $5\frac{1}{2}$ fathoms, lies sunk at about 300 yards 193° from Falsterbo Reef Light Vessel. The wreck of a vessel lies sunk in the vicinity of the temporary buoyed channel about 1 mile 22° from Falsterbo Reef Light Vessel. A green wreck buoy, carrying two green flags, has been established northeastward of the wreck.

Blenheim Shoal, with 4 fathoms water over it, lies with Falsterbo Reef Light Vessel bearing 283° , distant 3.6 miles.

Buoys.—A black spar buoy, surmounted by a ball, marks the north edge, and a red spar buoy surmounted by two upturned brooms, with a ball between them, the south side of Blenheim Shoal. From these buoys the beacons near Falsterbo Point and at Skanör are in line.

Water level.—On this part of the coast, with strong westerly winds, the water at times falls as much as 6 feet below the mean level; this circumstance must be borne in mind by large ships approaching the sound and by all vessels navigating with scant water.

Directions.—If Falsterbo Reef Light Vessel is not in position, vessels bound into the Baltic from the sound should keep Skanör Church well open westward of Falsterbo Lighthouse, or Falsterbo Light nothing northward of 35° , until Stevns Klint Light bears 280° , when course may be shaped to the eastward.

Kampinge Bugt.—About midway between Falsterbo Point and Stafstens Point, 9 miles eastward of it, the shore forms Kamping Bay, from the west point of which numerous rocks and shoals extend 2 miles in a southerly direction. Between these shoals and Stafstens Point the bay is $4\frac{1}{2}$ miles wide, with depths of 6 to 9 fathoms, decreasing gradually to 4 fathoms about $\frac{1}{2}$ mile from the northeastern shore of the bay.

Blinda Segelskär, the southernmost of the shoals extending from the west point, has a depth of 1 fathom, with 5 fathoms close to its outer edge; from the center of this shoal Falsterbo Point Lighthouse bears 283° , distant $3\frac{1}{2}$ miles.

Buoys.—A red spar buoy, with upturned broom, is moored in 5 fathoms southward of Blinda Segelskär.

About $1\frac{1}{2}$ miles east-southeastward from Blinda Segelskär there is a shoal with $2\frac{3}{4}$ fathoms water and a depth of $5\frac{1}{2}$ to 6 fathoms close around; nearly midway between these shoals is one of $3\frac{1}{4}$ fathoms.

Stafstens Point.—On Stafstens Point there is a white monument, a short distance westward of which stand two beacons indicating the direction of the telegraph cable to Cape Arkona. The cable is marked by a buoy.

Shoals.—About 2 miles, 133° from Stafstens Point and 1 mile westward of Trelleborg Light Vessel, is a shoal of $2\frac{1}{2}$ fathoms; another, of $3\frac{1}{2}$ fathoms, a short distance westward of it, is marked by a red spar buoy with two upturned brooms. Shoal water extends $1\frac{1}{2}$ miles southeastward from Stafstens Point.

Trelleborg Road and Harbor.—Trelleborg, situated $2\frac{1}{2}$ miles eastward of Stafstens Point, affords anchorage with offshore winds in a depth of about 5 fathoms, clay, mixed with sand and stones, about 1 mile from the harbor entrance. The town had 10,822 inhabitants in 1914.

The harbor, which is open to navigation throughout the year, is formed by two piers 640 yards long, extending in a south-southwest direction. The piers are 426 yards apart, but the outer ends approach each other, leaving an entrance 68 yards wide. Abreast the town and in the middle of the harbor there is a pier 197 yards long and furnished with a double set of railway lines. There is a 5-ton crane. A dolphin, 13 yards in diameter, is situated 65 yards outside the end of the pier. The two berths for the ferry steamers are on the eastern side of the harbor and are separated by a middle pier about 126 yards long. The general depth in the harbor is about 21 to 23 feet. With strong winds between west and northwest, the water falls about 4 feet below mean level. This, however, only lasts some hours.

A dredged channel about 1,800 yards long, with a least width of 87 yards, leads to the entrance of the harbor. The depth in the channel is about 23 feet at mean level.

Buoys.—The western side of the dredged channel is marked by eight black and white buoys, the outermost being 1,575 yards from the harbor entrance, and the eastern side by seven red spar buoys with down-turned brooms.

Light buoys.—Three red light buoys, each exhibiting a group flashing white light, showing 1 group of 2 flashes every 4 sec-

onds, mark the eastern side of the channel—one at the outer end, another just northward of the third red buoy from the southward, and the third about 80 yards southward of the sixth red buoy.

When necessary, on account of ice, the three light buoys will be withdrawn.

Bell buoy.—A red bell buoy is moored near and southward of the outer light buoy.

When necessary, on account of ice, the bell buoy will be replaced by a red mark with a ball.

Lights.—On Trelleborg East Pier, from an iron tower painted white with a black central band, at an elevation of 55 feet above the sea, is exhibited a group occulting white light with fixed red and green sectors. The white light is visible 11 miles, the red 8 miles, and the green 6 miles. (For details, see Light List.)

On Trelleborg West Pier a flashing red light visible 5 miles in clear weather is exhibited, at an elevation of 23 feet above the sea, from a white framework 16 feet high. (For details, see Light List.)

On the inner pier, at an elevation of 34 feet above the sea, a fixed green light is shown, and from a post on the shore behind at a height of 54 feet a fixed red light. These lights are 339 yards apart and, when in line, bearing 17° , lead between the channel buoys and into the harbor.

These lights are only shown when the Government railway steamer is leaving for, or arriving from, Malmo.

Light vessel.—A light vessel, exhibiting a fixed white light, elevated 23 feet above the sea and visible 10 miles, is moored off Trelleborg in a depth of 6 fathoms, about 1,150 yards outside the bell buoy, with the East Pier Lighthouse, bearing 10° , distant 1.4 miles. The vessel is painted red with *Trelleborg* in white letters on sides, and has a tower from which the light is exhibited.

The light vessel remains on her station throughout the year.

Fog signals.—During thick or foggy weather a bell is sounded on board the light vessel. Further signals and special signals made from the light vessel for the ferry steamers are described below.

A submarine bell has been established on the Trelleborg Reef Light Vessel. (For details, see Light List.)

Signals on light vessel.—If the light vessel is temporarily out of position it will be made known by day by means of a cone hoisted at that yardarm which faces the course of the ferry steamer; by night, the light will be extinguished and only the anchor light shown; during fog, the explosive and submarine bell signals will be discontinued, but the bell on deck will continue to be rung.

Signals and leading lights for ferry steamers.—The following signals will be made at Trelleborg Harbor and Trelleborg Light

Vessel, and the undermentioned leading lights will be occasionally shown.

Signals to announce that the ferry steamer is leaving or entering the harbor:

Leaving: By day—A black ball hoisted under the yard on the lighthouse on the eastern pierhead of the harbor and under the yard on the light tower of the light vessel. By night—A red light shown from the lower part of the tower, under the light, both on the eastern pierhead and on the light vessel.

The above signals will be shown 30 minutes before the ferry steamer leaves the harbor, and discontinued when she has passed the light vessel.

Entering: By day—A black double cone hoisted under the yard on the lighthouse at the end of the pier in the middle of the harbor. By night—A green light, visible only in the harbor, will be shown from the same light station.

The signals will be shown at least 30 minutes before the expected time of arrival of the ferry steamer and until she reaches the ferry berth or other mooring place.

Fog signals.—During fog, both by day and night, when the ferry steamer is leaving and arriving, 2 explosive reports in quick succession every 3 minutes will be given from the lightvessel and continued, until replied to by the ferry steamer, with alternate long and short blasts.

When the lightvessel is not on her station a gun on the east pierhead will be fired twice in quick succession every 3 minutes until it is certain that the arriving ferry steamer has received the signal.

An electric siren at the lighthouse on the eastern pierhead will, both by day and night during fog, give a signal every 30 seconds, thus: Blast, 15 seconds; silence, 15 seconds, commencing 30 minutes before the expected time of arrival of ferry steamer, and also shortly before their departure, and in both cases is continued until a short time after they have passed the pierheads.

A bell on the middle pier of the ferry berth will give 2 strokes in quick succession every 10 seconds when the arriving ferry steamer is to use the northern berth, and 1 stroke every 10 seconds when the southern berth is to be used.

The bell signal will begin when the ferry steamer enters the harbor and continue until she reaches her berth.

Lights at ferry berths.—The following range lights are shown at the ferry berths:

Southern berth—Two occulting green lights.

Northern berth—Two group occulting orange lights.

The lights kept in line lead to the berth to which they belong.

(For details see Light List.)

Thirty minutes before the expected arrival of a ferry steamer the lights are lit at the berth to which she is to proceed and are extinguished when she has reached it or other mooring place.

The following lights are shown at night on the pier between the ferry berths to indicate the condition of the berths:

Two white lights horizontal—Both berths clear for use.

One white and one red light horizontal—One berth vacant, the other occupied; the white light on the side nearest the vacant berth.

Two red lights horizontal—Both berths occupied.

The white and red lights are lit and extinguished at the same time as the leading lights mentioned above.

Warning that both ferry berths are occupied may also be given at night or during fog, by blue lights burned on the eastern pierhead or on board the vessel stationed in the harbor to assist.

Special signals for ferry steamers.—The under-mentioned signals are made from Trelleborg Light vessel and Trelleborg East Pier Lighthouse, respectively, at the time the ferry steamer is expected, to indicate that the depth in the harbor is less than 17½ feet, or that an obstruction exists in the channel.

1. From the light vessel.

(a) In clear weather: By day—2 balls, placed vertically at the yardarm. By night—A rocket every 3 minutes.

(b) In foggy weather, day or night: Two explosive signals in quick succession every 3 minutes, and 3 strokes in quick succession on the bell every minute.

In addition, the submarine bell will be sounded quickly and irregularly instead of giving 3 strokes every 10 seconds.

2. From the lighthouse.

(a) In clear weather: By day—2 balls at yardarm on tower. By night—A green light under the main light, and a rocket every 3 minutes.

(b) In foggy weather, day or night: Three explosive signals in quick succession every 3 minutes.

These signals are made from the lighthouse only until signaling has commenced from the light vessel, or until it is evident that the ferry steamer has observed the signals.

Storm signal station.—A signal staff and board for posting up storm signals and warnings have been established at Trelleborg.

Trelleborg—Harbor regulations.—The vessel's arrival is to be reported to the harbor master as soon as the customs' examination is completed, and a copy of the harbor regulations will be provided. A berth will be allotted by the harbor master, and must not be shifted without permission. Before berthing alongside yards must be

topped, all booms, davits, and outriggers housed or run in, anchor hoisted inboard, and anything hanging outboard hauled in.

Warps and hawsers must not be laid out across the harbor for any purpose without permission, except in case of necessity, in which case, if for warping, the work must be completed at once, or if otherwise a watch must be kept on the warp. Fenders must be provided. Anchors are not to be used without the harbor master's permission, when used they must be fitted with an efficient buoy and buoy rope.

Rowing boats, only, may lie at the quay steps, and they must lie with stem toward the steps.

Ballast must not be thrown overboard, but deposited in a place provided, and can only be obtained by application to the harbor master. Ballast may not be discharged at night unless a person appointed by the harbor master and paid by the vessel is present.

Nothing may be discharged into the roads, entrance channel, or harbor, and provision must be made when working cargo or ballast to prevent any falling into the harbor. Places marked by notice board are provided for depositing rubbish, ice, or snow.

Bathing is only allowed at the proper bathing place.

Vessels must pass a dredger to leeward if possible.

Rapid riding and driving is not allowed near the harbor, and horses and other animals must not be left unattended.

The harbor master may order vessels to shift berths if necessary.

For detailed regulations respecting fire and its prevention and other matters concerning the harbor, see the copy of the regulations provided.

Pilots.—Trelleborg is a pilot station; pilots attend at the harbor and meet approaching vessels outside the shoals.

The charge for pilotage ranges from 22 kroner for a vessel of 500–600 net register tons to 43 kroner for a vessel of 2,000 tons and over. In winter the charge is about 25 per cent in addition.

Directions.—Approaching Trelleborg by day, steer 7° for the church, pass westward of the lightvessel, and then bring the stone pier seen in the center of the harbor entrance to bear 17° ; steer for it on that bearing, which leads through the dredged channel between the buoys and into the harbor.

At night, after passing the light vessel, bring the red and green leading lights into line, bearing 17° , which mark leads through the dredged channel, passing westward of the three light buoys with group-flashing white lights, and into the harbor.

A wreck with 5 fathoms over it lies about 6 miles 164° from Trelleborg Reef Light Vessel.

Communication.—There is a telegraph office at Trelleborg; regular communication is maintained by steamer with places on the east and west coasts of Sweden and with Sassnitz in Rügen.

Repairs.—Minor repairs can be effected to iron vessels and engines. Tugs are available.

Supplies.—Ships' stores, provisions, coal, and water can be obtained in ample quantity.

Trade.—The exports are principally grain, flour, oils, and paints; imports chiefly consist of coal, coke, and grain.

Kullagrunden.—About 5 miles southeastward of Trelleborg and $1\frac{1}{2}$ miles from the shore there are three small shoals named Kullagrunden, the southernmost has a depth of 2 fathoms, the western 2 fathoms, and the eastern $2\frac{1}{2}$ fathoms. The 5-fathom line extends outside these shoals to a distance of 2 miles from the shore, with depths of $3\frac{1}{2}$ and 4 fathoms close to it, and a shoal of $2\frac{3}{4}$ fathoms lies just inside that line $1\frac{1}{4}$ miles eastward of the southern Kullagrund, and a mile offshore.

Buoy.—A spar buoy with three upturned brooms is moored on the southern edge of these shoals. Trelleborg Church bearing 324° leads westward, and Abbekås Point, well open of Smyge Lighthouse, bearing 66° , leads southward of these shoals. At night Trelleborg Light in sight (occulting white) leads westward of the Kullagrunden.

Smyge or Östra Torp Roads, on the east side of Smyge Point, affords anchorage, with offshore winds, in a depth of $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, about $\frac{1}{2}$ mile from the shore; vessels should, however, be prepared to proceed to sea if the wind changes. The lighthouse, a high warehouse near the shore, and Östra Torp Church serve to indicate Smyge Point. Grain, lime, and limestone are shipped from here. There is a telegraph office and railway communication.

Light.—On Smyge Point, 7 miles eastward of Trelleborg, stands a white circular iron tower 56 feet high, from which, at an elevation of 64 feet above the sea, is exhibited an alternating flashing red and white light, visible 14 miles. (For details see Light List.)

Storm signal station.—A signal staff and board for posting up storm signals and warnings have been established at Smyge Point.

Fog signal.—A fog horn worked by machinery is sounded at Smyge Point Lighthouse.

Coast.—Between Smyge Point and Sandhammer Point, 28 miles eastward of it, the shore forms a bay, at the head of which stands the town Ystad. In the bay there are depths of 13 to 15 fathoms, decreasing gradually toward the shore; the bottom is composed chiefly of sand and shingle.

Abbekås.—Near Abbekås Point about 9 miles east-northeastward of Smyge Point, the shore is low, and on the east side of the point there is a large well-built town named Abbekås; care is necessary in

thick weather not to mistake this town for Ystad. At Abbekås there is a small fishing harbor, which is at present sanded up. There is telegraphic and railway communication at Skifvarp, about $3\frac{1}{4}$ miles off.

About $2\frac{1}{2}$ miles east-northeastward of Abbekås and $\frac{1}{2}$ mile from the shore lies a small shoal with $2\frac{3}{4}$ fathoms over it, and depths of $3\frac{1}{2}$ to 5 fathoms close around.

Ystad Roads.—Spanska (Spanish) Road is situated $1\frac{1}{4}$ to 2 miles from the shore, and affords good anchorage in a depth of 7 to 9 fathoms, sand over clay, with Öia Mansion between the barracks and the church, bearing about 25° , and Kåseberg Head 98° .

The Outer Road, about 1,600 yards southwestward of Ystad Harbor entrance, has depths of $4\frac{1}{4}$ to $5\frac{1}{2}$ fathoms, sand over clay, between the extremities of the reefs; and the Inner Road, about 800 yards nearer the entrance of the harbor, has $3\frac{3}{4}$ to $4\frac{1}{4}$ fathoms, with the same bottom as the Outer Road. The best anchorage is with the rear lighthouse a little open west of the front lighthouse.

Shoals—Buoys.—From Stora Siöudden 1,400 yards westward of Ystad, there are reefs and shoals extending 1,200 yards in a southerly direction. Two detached shoals of $2\frac{3}{4}$ fathoms lie about 200 yards to the southwestward and another of the same depth about 350 yards southeastward of the extremity of this reef. A shoal of $2\frac{1}{2}$ fathoms, marked on its western side by a red spar buoy, with two downturned brooms, lies 1,700 yards southward of Stora Siöudden, and another of $2\frac{3}{4}$ fathoms, known as Roset, 150 yards eastward of it and just outside the 5-fathom curve, which is marked on its eastern side by a black spar buoy with a ball.

Refnabben, the eastern point of Ystad, is surrounded by reefs and shoals, which extend about 1,800 yards from the shore in a southerly direction, with a breadth of 1 mile. Yttre Herresta Grund, with a least depth of $1\frac{1}{4}$ fathoms, is the southwestern extremity of the foul ground extending from Refnabben.

A red spar buoy, surmounted by a ball under a downturned broom, and known as the fairway buoy, is moored outside the 5-fathom curve about 300 yards southwestward of the southwestern edge of Yttre Herresta Grund. Two shoals of $2\frac{3}{4}$ fathoms and one of 2 fathoms lie, respectively, 1,200, 800, and 600 yards from the harbor entrance and close eastward of the leading line. The 2-fathom depth is marked on its western side by a spar buoy with a downturned broom.

Light buoy.—A red light buoy, showing an irregular alternating white and red light, is moored in a depth of 5 fathoms immediately southwestward of the Yttre Herresta Grund Buoy.

This light buoy will be withdrawn when necessary on account of ice.

Antelope Grund, a shoal, on which the depth is $2\frac{3}{4}$ fathoms, lies in the approach to Ystad, with the range lights in line, distant about

1,800 yards from the front lighthouse and 200 yards from the Yttre Herresta red spar buoy.

Öja (Öja) Church, open westward of Ystad rear lighthouse, bearing 22° , leads westward of the shoal.

A rock, with $2\frac{3}{4}$ fathoms on it, named Kloster Grund, lies with Ystad Pierhead Lighthouse bearing 344° , distant 1.8 miles; it is marked by a red spar buoy with a ball between two upturned brooms.

A shoal of $3\frac{1}{4}$ fathoms, marked on its western side by a red spar buoy with ball over down-turned broom, lies southward of Ystad Reef and northward of Kloster Grund, with Ystad Lighthouse bearing 345° distant about 1.6 miles.

A rock, with $2\frac{1}{4}$ fathoms over it, lies with Ystad Pierhead Lighthouse bearing 318° distant 2,900 yards.

Shoal.—A shoal of $1\frac{1}{4}$ fathoms, with another of 3 fathoms close outside it, lies with Refnabben Point bearing about 337° distant $1\frac{1}{4}$ miles, and a shoal of 2 fathoms lies with the same point bearing about 298° distant $1\frac{1}{4}$ miles.

Wreck.—A wreck, with 6 fathoms over it, lies 167° $3\frac{1}{2}$ miles from Refnabben.

Ystad Harbor, situated 8 miles eastward of Abbekås Udde, is the best and most important on this part of the coast. It is formed by moles; the western mole, 339 yards long, extends in a southeasterly direction from the shore, and the eastern mole, 295 yards in a south-westerly direction; the entrance faces the southeast, and is 73 yards wide with a depth of $18\frac{3}{4}$ feet, sometimes 16 feet at low water level with westerly winds. The mole heads are painted white. The general depths in the harbor are from 13 to 22 feet. There is quayage of over 4,500 feet, with from 11 to 21 feet alongside. On the quay there are 980 yards of railway. There is a 5-ton crane. The harbor is being extended and new quays have been built.

Vessels drawing more than 17 feet should not proceed into the harbor. Vessels of this draft are also warned not to use the leading marks, as the lights in line lead over the rocky shoal Antelope Grund of $2\frac{3}{4}$ fathoms lying 400 yards westward of Yttre Herresta Grund.

The harbor is generally open all the year round, but sometimes there is ice obstruction in February.

Lights.—In the town, on the beach northward of the harbor, there is an octagonal iron tower 51 feet high, painted red two-thirds from the base, and the upper part white; it exhibits, at an elevation of 54 feet above the sea, a fixed white light visible 12 miles. (For sector see Light List.)

On the West Molehead stands an iron tower, painted white, 27 feet high, from which, at an elevation of 25 feet above the sea, is exhibited a fixed red light, visible 7 miles.

These lights are 423 yards apart, and when in line bearing 17° lead to the entrance of Ystad Harbor.

On the head of the East Mole, an unwatched flashing green light, visible 7 miles, is exhibited, at an elevation of 25 feet above the sea, from a white iron framework. (For details see Light List.)

Directions.—When about 3 miles from the harbor bring the inner lighthouse and that on the West Molehead, or the white and red lights at night in line, bearing 17° , and steer for them until within $\frac{1}{2}$ or $\frac{1}{4}$ mile from the buoys marking the Outer Herresta Grund, when keep a little to the eastward and preserve the above course, passing close westward of the buoys; when 300 yards past the buoys bring the lighthouses or lights again into line. Having passed the buoy with down-turned broom top-mark on the star-board hand steer to bring the white light in line with the light on the East Mole Head, to better open the harbor entrance, which lies obliquely to the entering course. Then steer in between the mole heads; sailing vessels should have an anchor clear for letting go and be ready to run out hawsers to the dolphins. In south and south-west gales, which cause a heavy sea at the entrance, where the course must be altered about four points to port, a stranger should not attempt to enter without a pilot. Sailing vessels when working in should not approach the western reefs nearer than to have the tower of Kloster Church just north of the Town Church steeple, nor nearer the eastern reefs than to have the inner lighthouse over the Eastern Molehead.

Pilots.—Ystad is a pilot station; pilots attend at the harbor and meet vessels outside the shoals.

Ystad, originally Oiestad, contains about 11,821 inhabitants. It is closely built, has several factories, mills, mechanical works, and foundries, and possesses a considerable number of shipping.

Communication.—There is regular communication by steamer with the principal ports on the coast of Sweden, Copenhagen, Bornholm, Lübeck. Ystad is connected by railway with Malmö, Landskrona, Helsingborg, Jonköping, Oskarshamn, and the northern parts of Sweden; there is also a telegraph station at Ystad.

Life saving.—There is a rocket apparatus station at Ystad.

Storm warnings.—A notice board for storm warnings is established at Refshusens fishing station, about $\frac{1}{4}$ mile east-southeastward of Ystad.

Coal can be obtained at Ystad, and the coaling is performed alongside wharves where the depth is 16 feet.

Patent slip.—See Appendix I.

Repairs.—Iron and wooden vessels can be repaired, and large repairs can be made to machinery; vessels of 600 tons have been built.

Tugs are available.

Supplies.—Fresh water and provisions of good quality can be obtained at moderate prices.

Trade and shipping.—Sugar, flour, cattle, brandy, fish, and grain are the chief exports. Coal and coke, grain, manure, bran, salt, oil cake, machinery, and dry goods are the principal imports.

Ystad—Harbor regulations.—Steamers lying alongside the quay are strictly forbidden to move their engines.

Sailing vessels arriving in the outer harbor—that is, the basin between the harbor entrance and the loading piers—must show their colors, let go a buoyed anchor, and furl sails.

Vessels may not anchor in the entrance channel and harbor entrance except in case of necessity.

Vessels loaded with inflammable materials or explosives must carry out the special regulations applicable.

Funnels of steamers may not be swept between 5 a. m. and 9 p. m.

Ryss Grund.—About 2 miles eastward of Reef Point and $\frac{3}{4}$ mile from the shore lies a shoal named Ryss Grund, with $2\frac{3}{4}$ fathoms water and a depth of 4 to 5 fathoms close around.

Anchorage.—Between Hammar Hills and Kåseberg Head, 8 miles eastward of Ystad, and about 1 mile from the shore, good anchorage may be obtained in a depth of 5 or 6 fathoms, sand and clay, sheltered from northeasterly winds.

Kåseberg (Kåse) Head, about $8\frac{1}{2}$ miles eastward of Ystad, has been described.

Kåseberga, on the east side of Kåseberg Head, has a small harbor with a depth of about 6 feet at mean water level, accessible by fishing craft. There is a telegraph station and railway at Hedvigsdal about $3\frac{1}{4}$ miles distant.

Wreck.—A wreck, with mast showing 3 feet above the water, lies sunk 5 miles southward of Kåseberg Head. (1915.)

Fishing light.—A white, red, and green light, elevated 11 feet above the sea, is shown from the east pier of Kåseberga Harbor when local fishermen are at sea.

Storm warnings.—A notice board for storm warnings is established at Kåseberga.

Osaknallen.—About $\frac{3}{4}$ mile from the shore, nearly midway between Kåseberg Head and Sandhammar Point, $4\frac{1}{2}$ miles eastward of it, lies a rocky shoal named Osaknallen, with $2\frac{3}{4}$ fathoms water and 5 to 7 fathoms close around. The high steeple of Ystad Church seen well open south of Kåseberg Head leads southwestward, and Sandhammar Point Lighthouse, bearing 55° , leads southeastward of Osaknallen.

Wrecks.—A wreck, with $5\frac{1}{2}$ fathoms over it, lies 213° , nearly $3\frac{1}{2}$ miles from Kåseberg Head, and another with 7 fathoms over it lies approximately 3 miles 170° from the same point.

Sandhammar Point (Sandhammaren), forming the southeastern extremity of Skånes Province, is low and sandy, and slopes down southeastward from Lyng-biarn (Lyngbjärn).

Föränderlig Bank extends over 6 miles in a southerly direction from Sandhammaren and has on it general depth of 7 to 10 fathoms, sand; the south and eastern edges are tolerably steep-to. During gales the sea breaks heavily on this bank, and with southwesterly winds the current sets strongly across it and toward the shore.

Light.—On the low foreshore of Sandhammar Point stands a red iron lighthouse, 96 feet high, from which, at an elevation of 101 feet above the sea, is exhibited a flashing white light, visible 16 miles. (For details see Light List.)

Fog signal.—Sandhammar fog signal consists of a siren worked by compressed air. Should the siren be out of order a gun will be fired. (See Light List.)

Life saving.—At Sandhammar Point there is a lifeboat and rocket station.

Wreck.—About 2,250 yards 200° from Sandhammar Lighthouse there is a sunken wreck, upon which the least depth is 17 feet; a green buoy, surmounted with a ball, is moored on the south side of the wreck.

The coast from Sandhammar Point trends in a northeasterly direction, 12 miles to Simrishamn, thence northerly for 7 miles to Stens Head, between which and Hanö, 28 miles northeastward of it, the shore forms Hanö Bight. The land on the north side of Sandhammar Point is low, but increases gradually in height toward Simrishamn. Borby Church Tower with lantern, and Nöbbelöf Church, which stands high near a grove, are conspicuous. Stens Head is a wooded hill, 397 feet high, precipitous toward the sea, and forms a good object for recognizing this part of the coast.

Light.—A group flashing white light with red and green sectors, elevated 42 feet above the sea and shown from a white reinforced concrete tower 30 feet high, is exhibited at Stens Head. The white light is visible 12, the red 9, and the green 7 miles. (For details see Light List.)

Örnhökaknösen Shoal, with $5\frac{1}{2}$ fathoms over it, on which the sea breaks in heavy weather, lies 4 miles 45° from Sandhammar Lighthouse, and $1\frac{1}{2}$ miles from the shore. Sandhammar Lighthouse, bearing 239° , leads $\frac{2}{3}$ mile southeastward of this shoal.

Skillinge is a fishing village situated $6\frac{1}{2}$ miles northeastward of Sandhammaren Lighthouse, and has a small harbor formed by two

moles, in which the depth is about 13 feet at mean level, and about 8 feet at low-water level, which, however, seldom occurs. There are about 280 yards of quayage with the same depth alongside as in the harbor. In westerly gales vessels can anchor 2 miles offshore in 25 fathoms, good holding ground of clay and sand. Pilots are obtained from Simrishamn by day.

Light.—At Skillinge a white fishing light with red sector is exhibited at an elevation of 19 feet above the sea. (For sector see Light List.)

Supplies.—Ships' stores, provisions, coal, and water can be obtained.

Storm warnings.—A notice board for storm warnings is established at Skillinge.

Brantevik—Rocket station.—At Brantevik, a small village 3 miles northeastward of Skillinge, there is a rocket station.

Storm warnings.—A notice board for storm warnings is established at Brantevik.

Simrishamn is formed by two moles; the northern, 328 yards long, forms a curve, the end of which approaches the southern mole, 82 yards long, leaving an entrance 115 feet wide with a depth of 18 feet in the middle. The ends of the moles are whitewashed. There is an inner harbor formed by two piers, the western of which extends about 131 yards from the western shore in an easterly direction, and the eastern about 240 yards long, from the inner part of the southern mole in a west-northwesterly direction. The western end of the eastern pier extends northward of and past the end of the western pier, leaving an entrance to the inner harbor 33 feet in width. A loading pier, about 65 yards long and furnished with railway lines, extends from the west shore of the outer harbor immediately to the north of the western pier just mentioned. The depth in the outer harbor over a breadth of 328 feet, also alongside the south side of the loading pier and in the inner harbor, is about 16 feet at mean water level and 14½ feet at low level. Eastward of and connected with the inner harbor is a basin 60 yards long and 35 yards wide, for fishing boats, with a depth of 9 to 10 feet. The harbor is, in general, never closed by ice, but a heavy swell outside is felt in the outer harbor.

Shoal.—From the outer part of the north mole a shoal, named Bojan, projects 300 yards in a northeasterly direction, with a depth of 9 feet. It is marked by two red spar buoys with upturned brooms. The small town of Simrishamn lies low.

Lights.—A fourth-order flashing white light with red and green sector is exhibited 46 feet above the water from a white reinforced concrete tower 37 feet high at Simrishamn.

The white light is visible 12 miles, the red 9 miles, and the green 7 miles. (For details see Light List.)

Range lights for entering the harbor, the outer fixed green at the height of 26 feet, the inner fixed red 30 feet above the sea, are shown from posts on the western inner pier. They are 112 yards apart, and when in line bear 250° .

Pilots.—Simrishamn is a pilot station; pilots attend at the harbor and meet vessels outside the shoals in the daytime only.

Directions.—When about 2 miles off the entrance to Simrishamn, bring a mill, about $\frac{1}{2}$ mile west-southwestward of the town, in line with the front gable of a house facing the harbor, bearing 252° , which mark leads well southward of the Nedian Shoal and between the buoys outside the harbor entrance, two of which—red broom buoys—are left to the northward and two plain black and white spar buoys to the southward. Strangers should not enter without a pilot, especially in bad weather. Sailing vessels should have an anchor clear and hawsers ready to run out.

At night the red and green range lights in line, bearing 250° , lead through the harbor entrance. When past the mole heads haul about a point to starboard to avoid the eastern pier of the inner harbor.

Anchorage.—In strong westerly winds vessels can anchor north of the harbor in 7 to 8 fathoms good holding ground of sand and clay. The broad bank with the Bojan Shoal on it should be avoided.

Supplies.—Coal and provisions can be obtained in small quantities. Water can be had.

Communication.—There is telegraphic and railway communication; also regular steamboat communication with Stockholm and places between.

Trade.—The imports are coal, coke, grain, oil cakes, etc.; the exports are flour, tiles, quartz, leather, etc.

Storm signal station.—A signal staff and board for posting up storm signals and warnings have been established at Simrishamn and a notice board only at Vik fishing village, situated 4 miles northward.

Långa Grand, with $2\frac{3}{4}$ fathoms water and a depth of 20 fathoms close around, lies $4\frac{1}{4}$ miles 100° from Simrishamn.

Buoy.—A red spar buoy, with an upturned broom over a ball, is moored in $9\frac{1}{2}$ fathoms on the south side of this danger.

Nedian (Nedjan) is a small rocky shoal with $1\frac{1}{4}$ fathoms water and 6 to 8 fathoms close-to, from the center of which Simrishamn Church bears 235° , distant $1\frac{1}{2}$ miles.

Buoy.—A red spar buoy, with two upturned brooms, marks this shoal on the southeast side.

Clearing marks.—The southern mill at Simrishamn in line with the front of the house facing the harbor or the Simrishamn Range Lights in line, lead south of Nedian.

Rörumsklabb Shoals, situated about $1\frac{3}{4}$ miles south-southeastward of Stens Head and $\frac{1}{2}$ mile from the shore, consists of two rocky heads with 4 fathoms water. Between these shoals and the shore there are depths of 6 to 7 fathoms.

Kivik, a fishing village about $2\frac{1}{4}$ miles northwestward of Stens Head has a small harbor with from 8 to 10 feet of water, formed by a breakwater extending from the southern shore in a north-northwest direction, which affords protection from all winds; the bottom is blue clay. The deepest draft that can enter at mean water level is 8 feet. There are loading moles and quays of a total length of 322 yards, with 10 feet of water alongside at mean level. Ice obstruction occurs in February and March.

Pilots are obtained in the daytime from Simrishamn.

Good anchorage may be obtained in a depth of 5 to 6 fathoms, sand and clay, during offshore winds, abreast Kivik, about $\frac{1}{2}$ mile from the shore.

Lights.—Fishing lights are exhibited occasionally when required: fixed white at the height of 57 feet above the sea and fixed red 38 feet high. These are range lights 127 yards apart, and are in line when bearing 225° .

Supplies.—Water can be obtained and a small quantity of coal and provisions.

The nearest telegraph and railway are at Hvitaby, $2\frac{3}{4}$ miles off.

Grain is exported and coal imported.

Storm warnings are posted on a notice board at Kivik, and at Hvitamölle to the northward.

Hvitamölle is a fishing village 1 mile northwestward of Kivik; there is anchorage about $\frac{1}{4}$ mile northward of the village in a depth of 4 to 5 fathoms.

Light.—A fishing light, fixed white, visible 5 miles, is exhibited at the eastern pierhead from February 1 to June 1, and from September 1 to January 1, when required.

Lillgrund, a rocky shoal with 3 fathoms water, lies $\frac{1}{2}$ mile northeastward from Hvitamölle. Lindgrund, a rock covered with 2 fathoms, lies $\frac{1}{2}$ mile norward of Lillgrund, and nearly the same distance from the shore.

Botildas Breakers, a rocky shoal of $3\frac{3}{4}$ fathoms, lies $12\frac{1}{2}$ miles 38° from Stens Head, and 9 miles southeastward from Åhus. Kiörna Reef, with a least depth of 8 fathoms, lies about $1\frac{1}{2}$ miles south-southwestward from Botildas Breakers, the depth between them being 10 fathoms.

A shoal of 5 fathoms lies 2 miles northward of Botildas Knall.

Kiviks Bredgrund, with 2 fathoms least water and depths of $3\frac{3}{4}$ to 5 fathoms close around, lies 6 miles 144° from Åhus. A sunken wreck with $3\frac{1}{2}$ fathoms over it lies $\frac{1}{2}$ mile northward of the shoalest spot.

Shoal.—Kiviks Bredgrund stands on a shoal about 2 miles in length east-northeast and west-southwest, and $1\frac{1}{4}$ miles in breadth, with general depths of $4\frac{3}{4}$ fathoms, but a depth of $3\frac{3}{4}$ fathoms lies near its western end, about $1\frac{1}{4}$ miles west-southwestward from the 2-fathom patch.

Buoys.—Kiviks Bredgrund is marked on its eastern side by a black and white spar buoy surmounted by a ball and on its north-western side by a red spar buoy surmounted by a ball over a down-turned broom.

Clearing mark.—Stora, the highest of the Fjelkinge Backe, open westward of the beacon bearing about 349° , leads westward of Kiviks Bredgrund.

Approach to Åhus—Dangers—Biäret (Bjäret) Reef—Buoys.—Biäret Reef, with 2 fathoms water, and 4 to 5 fathoms close around, lies 5 miles east-southeastward from Åhus: it is marked on its western side by a red spar buoy, surmounted by two brooms with bases turned away from each other.

A small shoal, with a depth of $2\frac{1}{2}$ fathoms over it, lies northwestward 1,800 yards from Biäret, and is marked by a spar buoy surmounted by a cross. Another small shoal, with $1\frac{1}{2}$ fathoms water and 6 to 7 fathoms around, lies west-northwestward 1 mile from Biäret, and is marked on its eastern side by a black and white conical buoy: a small patch of 2 fathoms lies a short distance west-southwestward of it. A patch, with 15 feet over it, lies 700 yards northward from Biäret Reef, and nearly between it and Pälla Grund. About $\frac{3}{4}$ mile westward of Biäret is a shoal of $3\frac{1}{4}$ fathoms, and 800 yards and $1\frac{1}{4}$ miles southwestward of Biäret are two small patches, depth not given.

Six shoals of from $3\frac{1}{4}$ to $3\frac{3}{4}$ fathoms, and two additional patches on which the depth is not given, have been located in the area between Kiviks Bredgrund, Biäret, and Afton Grund, of which the outermost, with $3\frac{1}{2}$ fathoms, lies about 1.9 miles northeastward of Kiviks Bredgrund. A depth of $4\frac{3}{4}$ fathoms lies about 1,600 yards northeastward, and another of 4 fathoms 1.7 miles east-northeastward of the 2-fathom patch on Kiviks Bredgrund.

Pälla Grund—Buoy.—Pälla Grund, with 2 fathoms water and depths of 5 to 8 fathoms close around, lies over a mile north-northeastward from Biäret (Bjäret) Reef, and $4\frac{3}{4}$ miles 101° from the entrance to Åhus: it is marked on its northern side by a black spar buoy with two balls. Nymö Church, in line with the west side of Lilla Fielkinge (Fjelkinge) Backe, leads westward of Biäret Reef

and Pälla Grund, but over the $2\frac{1}{2}$ -fathoms shoal lying 1,800 yards northwestward from the former. Vessels of more than 17 feet draft are recommended not to pass westward of Biüret and Pälla Grund when approaching the eastern entrance to Åhus.

Inner shoals—Buoys.—From the south side of Helge River Entrance a rocky shoal extends about 1 mile from the shore; this shoal is surrounded by numerous smaller shoals, some of which lie 2 to $2\frac{1}{2}$ miles from the shore.

Afton Grund, the southernmost of these shoals, has a depth of 2 fathoms, with 4 to 7 fathoms close around; about $\frac{1}{2}$ mile north-northwestward of Afton Grund there is a small shoal with $1\frac{1}{3}$ fathoms water, the western edge of which is marked by a red spar buoy surmounted by a ball and down-turned broom.

Tistlarna Shoal, of $1\frac{1}{4}$ fathoms, is marked on its northern side by a black spar buoy, surmounted by a ball. The southern end of Wiltshires Grund has a red spar buoy moored off it, surmounted by a ball and an upturned broom, and the north side by a black and white spar buoy.

Ten-feet (Tiofots) Grund lies a little over 2 miles eastward from Åhus and is marked by a black spar buoy.

A rock, on which the depth is $2\frac{1}{2}$ fathoms, lies east-southeastward distant 1,400 yards from Ten-feet Grund; the southern side of this rock is marked by a red spar buoy, surmounted by three upturned brooms. Thorp Grund, with a depth of 12 feet, lies southeastward distant about 1,200 yards from the outer lightbuoy; a large black and white spar buoy is moored north-northeastward of the shoal.

Many other shoals, some of which are marked by buoys or beacons, lie between Ten-feet (Tiofots) Grund and the shore.

Beacons—Landmarks.—South Beacon, on Åhus Espet, the low wooded tongue of land on the south side of Helge River Entrance, is 62 feet high, and consists of a pole with stays, and a white square board point down as topmark. A white triangular board, point upward, and 12 feet high, is fixed to the pole at 12 feet from the ground.

Close eastward of South Beacon is a white rectangular beacon 30 feet high, with stays.

North Beacon, situated about $1\frac{1}{3}$ miles northward from the Helge River Entrance, is an iron mast 59 feet high, with iron cable stays, and topmark consisting of a white triangular board, point upward.

Plåtastenarnes Beacon, on the shoal of that name, lies east-northeastward of the harbor entrance, and is a brown iron pole, 6 feet high, with a white square topmark, the diagonal of which is in prolongation of the pole.

At the end of the northern entrance jetty is a high pilots' lookout, the upper part consisting of a small house.

Wanneberga (Vanneberga) fir groves, 3 miles northward of Åhus, consist of two plantations separated by a narrow gap.

Fielkinge (Fjelkinge) Backe, situated about $7\frac{1}{2}$ miles northward from Åhus, consist of two barren hills connected by a low saddle; Stora, the northern hill, is 332 feet high, and Lilla, the southern, 216 feet high; these hills bear northwest and southeast from each other and can be recognized from a considerable distance seaward. Ifö Klack is a high, round hill with trees on its summit, situated 6 miles northeastward of Fielkinge Backe. Nymö Church, about 2 miles southward of Lilla Fielkinge (Fjelkinge), has no steeple and is whitewashed.

Lights.—From an iron framework lighthouse, with a rectangular top mark, painted white, situated about 220 yards within the extremity of the northern jetty at the entrance to the Helge River, a flashing white light is exhibited, 30 feet above the sea, and visible 10 miles. (For details, see Light List.)

From a white tower, surmounted by a white triangular shape, point upward, standing about 656 yards 276° from the front building, is exhibited an occulting white light, 59 feet above the sea, and visible 13 miles. (For details, see Light List.)

These lights in line, bearing 276° , lead through the buoyed channel from the sea to the entrance of the Helge River.

Channel—Buoyage.—The channel at the entrance of the Helge River leading to Åhus, and the approach from the eastward, has a depth of 21 feet from the outer light buoy to within 1,100 yards of the harbor piers, when the depth decreases to 20 feet to the harbor, where it is 19 feet; it lies between the following buoys:

A black light buoy, showing an irregularly alternating white and red light, moored eastward of a 16-foot shoal on the southern side of the entrance to the channel, in a position with eastern extremity of Hammar bearing 347° , distant 2.4 miles, and South Beacon 276° .

A black light buoy, showing a flashing red light every $1\frac{1}{2}$ seconds, moored on the southern side of the channel, in a position with South Beacon bearing 270° , distant 1.7 miles, and the eastern extremity of Hammar 11° .

Two spar buoys mark the northern edge of Trulssons Grund, on the southern side of channel.

A red bell buoy, moored southward of Tiofots Grund and on the northern side of the entrance to the channel, opposite light buoy (a) above.

On the northern side of the channel, opposite light buoy showing a flashing red light, the southern side of a shoal is marked by a red spar buoy, surmounted by an upturned broom, with a ball above.

A spar buoy, with downturned broom, marks Sillpaken Shoal (700 yards eastward of which there is a 3-foot shoal marked by a spar buoy with two upturned brooms), on the northern side.

The channel within Sillpaken is marked on its northern side by three red, broom, spar buoys; and on its southern side by three black, ball, spar buoys.

When necessary on account of ice the inner and outer light buoys, and the bell buoy, will be replaced by plain marks.

NOTE.—After passing the piers, a red light (rear) and green light (front) shown at Slotts Backen (Castle Hill), in line, lead up the river.

Shoals.—The following shoals have been discovered southeastward of Åhus:

A shoal with a depth of 21 feet in (approximately) latitude $55^{\circ} 52' 05''$ N., longitude $14^{\circ} 27' 00''$ E.

A shoal with 24.6 feet in (approximately) latitude $55^{\circ} 51' 05''$ N., longitude $14^{\circ} 27' 15''$ E.

Wreck.—A wreck, with masts above water, lies sunk in 7 fathoms of water southward of Åhus, in (approximately) latitude $55^{\circ} 53' 45''$ N., longitude $14^{\circ} 19' 20''$ E.

A green wreck buoy carrying two green flags has been moored east-northeastward of the wreck.

Anchorage.—Spanish (Spanska) Road, on the south side of the shoals, extending from Helgø River Entrance, affords anchorage in a depth of 4 to 5 fathoms, sand and clay, about 1 mile from the shore, but is quite exposed.

From the eastern approach to Åhus a channel leads toward the anchorage named North Deep, in which there is a depth of about 4 fathoms, sand and clay, $\frac{3}{4}$ mile northeastward from Helgø River Entrance, and sheltered by the banks outside.

Hålan, situated east-southeast from the river entrance, affords the best anchorage in a depth of 4 to 5 fathoms, sand and blue clay, with Stora Fielkinge (Fjelkinge) Backe, midway between North Beacon and Wanneberga Fir groves, and Åhus Church in line with the pole beacon east of South Beacon.

During southerly and easterly winds the anchorages off Åhus are not to be recommended; vessels may, however, with good ground tackle, ride out gales from those quarters in tolerable safety.

Pilots.—Åhus is a pilot station; pilots meet vessels outside the outer banks. Seamen should not approach the harbor nearer than 3 miles without local knowledge.

Directions—Eastern entrance.—The eastern entrance can be used by vessels of 18 feet draft at mean water level. To approach, steer 321° for the Fielkinge (Fjelkinge) Backe, or 347° for Ifö Klack, then Lägerholm Lighthouse should be seen on with the west-

ern slope of the latter hill; this course leads eastward of Botildas Breakers, as well as Biäret (Bjäret) Reef and Pälla Grund. When the Range lighthouses or lights on the Helge River come in line bearing 276° , steer for them and be guided by the buoys and light buoys previously mentioned, the latter being on the south side of the channel. As the channel is only 55 yards wide in some places, the greatest caution is necessary. Should the two lighthouses not be immediately distinguished by day, the white southern mole head in line with the north side of a large high warehouse leads northward of both light buoys.

South entrance is suitable for vessels of $8\frac{1}{2}$ feet draft at mean water level. When approaching steer for Stora Fielkinge (Fjelkinge) Backe, bearing about 349° , and as soon as North Beacon is sighted bring it in line with the said hill, 347° , which mark leads westward of Kiviks Bredgrund and Afton Grund until Åhus Church bears 308° , when the vessel should either heave-to for a pilot or anchor in Spanish Road; see Anchorages. Hence the channel is marked at the southern end by two pairs of spar buoys, red with brooms on the starboard hand entering and black and white buoys on the port. Farther in there is a broom buoy on the starboard hand, westward of Flintan Grund.

North Channel is suitable for vessels of 12 feet draft. Approach as directed for the eastern entrance, steering 347° for Ifö Klack, until Åhus Church tower is in line with the pole beacon eastward of South Beacon. Then alter course to 289° for North Beacon. When the church tower comes three times its breadth northward of South Beacon, bearing 263° , steer toward this mark until Lindö Pole Beacon is in line with Ifö Klack, 357° , when a pilot should be waited for.

Åhus Harbor, near the entrance to the Helge River, has a depth of 19 feet at mean water level and 1 foot less at low level, with a bottom of clay, mud, and sand. The entrance to the harbor lies between two moles 616 yards long, extending in an easterly direction from the mouth of the river, and is so narrow that two vessels can not pass each other. Both moleheads are painted white. The quays are partly furnished with railway lines of a total length of 1,148 yards and have a depth alongside of from 10 to 16 feet. The new quay is about 2,900 feet in length. There are three cranes, capable of lifting 6, 10, and 13 tons. The harbor is generally open throughout the year to steam vessels, but is usually inaccessible by sailing vessels from December to February on account of ice.

Harbor regulations.—Vessels arriving must show their colors until the customs examination has been held, and vessels may not navigate the entrance channel at a greater speed than necessary for maneuvering. They may not stop in the entrance channel nor anchor there.

For further regulations, see under Trelleborg and the pamphlet of regulations published by the harbor authorities.

Navigable depths.—The harbor of Åhus is accessible by vessels of 18 feet draft, while boats of 2 feet draft only can proceed to Kristianstad, 8 miles northward of Åhus.

Åhus, a town with about 1,200 inhabitants, lies on the north bank of the Helge River, about 1 mile within the entrance. It is the seaport of Kristianstad, a town of 11,388 inhabitants, which lies 8 miles to the northward.

Communication.—Åhus has railway communication with Kristianstad and the north, and also with places to the westward. There is regular steamer communication with Stockholm and places between, and also with Kristianstad by steamboat. There is a telegraph office.

Supplies.—Provisions and coal can be obtained; there is a water-tank boat.

Repairs.—There is a considerable machinery shop in Kristianstad.

Trade.—Exports chiefly consist of cement, granite, limestone, pit-props, and paper; imports of coal, coke, grain, manure, and oil cake.

Landö Harbor, situated about 5 miles northeastward of Åhus, affords good shelter for vessels in distress; it is protected by a group of small islets and a reef extending about $2\frac{1}{2}$ miles from the shore. The depth in this harbor is $19\frac{1}{2}$ feet at mean water level, and about 1 foot less at low level, but close to the pier there is a depth of 6 feet only. The bottom is clay and small stones mixed with sand. The deepest draft that can enter is $18\frac{3}{4}$ feet at mean water level. A vessel that has lost her anchors can ground without danger on mud bottom eastward of Lindö. Ice obstruction occurs generally in January and February. Pilots for Landö Harbor can be obtained at Åhus.

Beacon.—On Lindö, on the north side of the harbor, is a pole beacon with a white square board as top mark.

Directions.—When making the land, the directions for the North Channel to Åhus hold good. To enter Landö Harbor steer in with Lindö Beacon in line with Ifö Klack, 357° , and when up with Äggsjär Islet, on the starboard side of the channel, a black and white spar buoy will be seen marking a shoal of 10 feet, which should be left to port, and anchorage taken up off the houses of Landö.

Lägerholm—Light.—On Lägerholm, a small rocky islet, 2 miles east-southeastward of Landö Harbor, from a white tower 55 feet high is exhibited, at an elevation of 55 feet, an unwatched flashing white and red light, visible 13 miles.

(For sectors, see Light List.)

Detached shoals of $2\frac{3}{4}$ fathoms and less extend 1 mile south-south-westward and $1\frac{1}{2}$ miles east-northeastward of Lägerholm, and a patch of 3 fathoms lies 1.3 miles eastward from the islet.

Kalkgrunden.—Several detached rocky shoal patches, named southwest and northeast Kalk Grund, lie in the bight between Åhus and Lägerholm, and extend from $1\frac{1}{2}$ to 2 miles from the shore.

Sten Grund is a detached shoal, with $2\frac{1}{2}$ fathoms over it, lying $1\frac{1}{2}$ miles southward of Lägerholm: a patch of $2\frac{3}{4}$ fathoms lies $\frac{1}{4}$ mile southward, and another of $2\frac{3}{4}$ fathoms lies 1,400 yards eastward from Sten Grund, on the line of Solvesborg Range Lights, and is marked on its east-southeast side by a black spar buoy with three balls. About 700 yards eastward and southeastward of the latter shoal are patches of $3\frac{3}{4}$ fathoms.

Niola Grund, with 6 feet water, and a depth of 4 to 5 fathoms close around, lies $\frac{3}{4}$ mile north-north-eastward from Lägerholm. About 1 mile eastward of Niola Grund are two patches of $3\frac{1}{4}$ and 4 $\frac{1}{4}$ fathoms, $\frac{1}{2}$ mile apart.

Skintosa (Skintosflöten), a dangerous bank situated in the middle of the bay between Landö and Kråk Point (the southeast extreme of Lister Peninsula, $10\frac{1}{2}$ miles eastward of it), is about $1\frac{3}{4}$ miles long east and west, and nearly 1 mile broad, with several shoals of 2 to 3 fathoms water.

Shoals of $3\frac{1}{2}$ fathoms lie about $\frac{1}{2}$ mile southwestward and $\frac{3}{4}$ mile west-southwestward from the west end of Skintosa, one on either side of the line of Solvesborg Range Lights. A small patch, depth not given, lies 800 yards northeastward from the depth of 3 fathoms at the northeast end of Skintosa.

Buoys.—The western edge of Skintosa is marked by a red spar buoy, with down-turned broom over a ball; the patch of 3 fathoms at the northeast end is marked on its east side by a black and white spar buoy with one ball, and the southeastern side of Skintosa by a black and white spar buoy with two balls.

Clearing marks.—Lägerholm Lighthouse in line with a small plantation at Landö, bearing 289° , leads southward; Solvesborg Church in line with a group of trees on Falk Point, west side of the entrance to Solvesborg, bearing 17° , or the range light structures or lights near the same place, in line 21° , leads westward; Hanö Lighthouse seen over Kråk Point, bearing 84° , leads northward, and the light structure off the eastern entrance point to Solvesborg, with flashing white light, bearing 349° , or Solvesborg Church close eastward of the eastern cairn on Kiaholmen, leads eastward.

Saxa vik.—Between Tnnör and Flitsör lies the channel leading to Saxa vik, with depths of 3 and 4 fathoms in the middle, and 13 feet on the bar. Pilots for Saxa vik can be obtained at Solvesborg.

Approach to Solvesborg (Sölvesborg).—Dangers on west side.—Buoys.—**Tunör**, a dangerous shoal situated on the west side of the entrance to Solvesborg is nearly 1 mile long northwest and southeast, and $\frac{1}{2}$ mile broad, having on its eastern part several rocks above water. A patch off the south extreme of this shoal, with $2\frac{1}{2}$ fathoms over it, near the line of range lights, is marked by a black spar buoy surmounted by two balls. About 1 mile west of Tunör there are several shoals with $1\frac{1}{4}$ to 3 fathoms water named Flitsör. Between Tunör and the western entrance point to Solvesborg are numerous shoals and islets, and a shoal of $2\frac{1}{2}$ fathoms marked by a black and white spar buoy, lies eastward of Tunör, between it and the line of Solvesborg Range Lights.

Ledgrund, with $1\frac{1}{2}$ fathoms on it, lies in midchannel eastward of Tunör, and about 1,800 yards southwestward from Timan Skär.

It is marked on its northwest side by a red spar buoy with ball over down-turned broom, and on the southeast by a black spar buoy with a ball. Northward of Ledgrund, and 1.7 miles 201° from the front light, and on the line of the range lights, is a shoal of $2\frac{1}{4}$ fathoms, marked by a black and white spar buoy.

East side.—Shoals extend nearly $1\frac{1}{4}$ miles south-southwestward from the eastern entrance point to Solvesborg, and are marked by red spar buoys surmounted by upturned brooms. The southwestern of these, named Refbådarne, has about 2 fathoms on it, and is marked on its southwest side by a red spar buoy with upturned broom over two balls. About midway between Refbådarne and the west end of Skintosa is a shoal of $2\frac{3}{4}$ fathoms, marked on its northwest side by a red spar buoy with two downturned brooms, and on its northeast side by a black buoy; southward of this shoal and midway between it and Skintosa is a shoal of 2 fathoms, and $\frac{1}{4}$ mile westward and north-northeastward of it are two small patches, depth not given.

Lights—Range lights.—On the mainland on the west side of the entrance to Solvesborg Range Lights are established. The front light, fixed red, and elevated 25 feet above the sea, is shown from a small hut on a white cairn; the rear light, fixed white, elevated 49 feet, is shown from a white iron framework beacon. The lights are 415 yards apart, and in line bear 21° .

Timan Skär.—An occulting white light with red and green sectors is exhibited at an elevation of 16 feet above the sea from a small white hut on iron framework, situated on Timan Skär, eastern side of the entrance to Solvesborg. (For details see Light List.)

Trestenar.—A flashing white light, elevated 17 feet above the sea, is exhibited from a white square iron framework on Trestenar Shoal, above water, off the northwestern side of the eastern entrance point. (For details see Light List.)

Kiaholmen.—A flashing green light, elevated 11 feet, is exhibited from a white square iron framework on the southern part of Kiaholmen, within the entrance, and eastward of the first-mentioned pair of lights. (For details see Light List.)

Sjöfyren.—A fixed green light, elevated 21 feet, is exhibited from a white square iron framework situated 410 yards 17° from Kiaholmen Light. Kiaholmen and Sjöfyren are range lights.

The channel to Solvesborg is marked by seven dolphins, five of which are red on the starboard side entering and two black on the port side. From these dolphins lights are exhibited, those on the red dolphins showing green southward and red northward, and on the black dolphins red southward and green northward.

Solvesborg (Sölvesborg) Port.—The port of Solvesborg, which is well sheltered and has good anchorage, is situated in the north-western part of Hanö Bight; it comprises outer and inner roads and a harbor. The channel leading to Solvesborg lies in a north-easterly direction between Tunör and the shoals extending south-southwestward from Vestranäs (Västranäs), the eastern entrance point; a dredged channel, marked by dolphins, black on the port hand entering and red on the starboard, leads through the flats to the quays, and vessels of 15 feet draft can proceed to them. A second buoyed channel, available for vessels of 8½ feet draft, leads from sea past the point southward of Vestranäs to the harbor channel.

Roads.—The Outer Road, about 2 miles southward of the town and westward of Timan Skär, has a depth of about 20 feet at mean water level, with a bottom of sand and clay. There is swinging room only for a few vessels, and southwest winds send in some sea.

The Inner Road, about 1 mile southward of the town, has a depth of 17 feet at mean water level, over mud and clay. The greatest draft that can enter is 16 feet. There is a quay about 109 yards long, with nearly 16 feet alongside, and a 15-ton crane. Stone and wood are shipped and coal is discharged here.

Pilots.—Solvesborg is a pilot station; pilots meet vessels outside the Refbådarne outside the outer shoals, and can also be obtained at Solvesborg Harbor. They can not be obtained at night.

Directions—By day.—Having passed eastward of Stengrund, bring the apse of Solvesborg Church in line with the front range light structure, bearing 16°, which mark leads between Skintosa and some shoals of 2¼ fathoms lying westward of it. Vessels of deep draft must avoid some patches of 3¼ and 3½ fathoms lying, respectively, southeastward and north-northeastward of Stengrund. After passing Skintosa, the above mark leads westward of a red spar buoy with two down-turned brooms, and a black buoy, marking some patches of 2¼ fathoms, and eastward of the black and white spar

buoy, with two balls moored southward of Tunör. When between these buoys and the red spar buoy with upturned broom over two balls, marking the south side of the Refbådarne, a stranger should heave-to and wait for a pilot. Should no pilot present himself a vessel may continue on the same course, leaving a black and white spar buoy, marking a shoal of $2\frac{1}{2}$ fathoms, to port, and the red spar buoy with ball, on the northwest side of Ledgrund, to starboard; here a patch of $3\frac{1}{2}$ fathoms, about 150 yards westward of Ledgrund, should be avoided by vessels of deep draft. When the northwest buoy of Ledgrund is abaft the beam turn about 2 points to starboard and steer for Timan, leaving a black and white spar buoy on a $2\frac{1}{2}$ -fathom shoal to port, and two red spar buoys to starboard. After passing the inner of the two last-mentioned buoys turn 2 points to port, and, just before Timan comes abeam, anchor about 400 yards from it in the Outer Road. Afterward the channel leads between a number of buoys, and passes westward of Kiaholmen, on which is a white beacon or cairn $14\frac{1}{2}$ feet high, and further to the harbor, but for this a pilot is necessary for a stranger.

Vessels approaching from the eastward can bring Stora Fielkinge (Fjelkinge) Hill to bear 293° and steer for it, which leads nearly a mile southward of Westerås (Västerås) Grund, and northward of the spar buoy at the northeast end of Skintosa and of the $2\frac{1}{2}$ fathom patch lying between Skintosa and Refbådarne, and toward the buoy marking Tunör. When off the entrance, wait for a pilot or follow the previous directions.

When Timan Lighthouse is in line with Solvesborg Church, a vessel can turn northward, leaving the buoy on Refbådarne to starboard, and pass eastward of the black spar buoy with ball on the southeast side of Ledgrund, leaving red broom buoys to starboard.

At night, when approaching westward of Skintosa, bring the white and red lights on the western side of the entrance to Solvesborg open to the eastward, to pass eastward of the patch of $2\frac{1}{2}$ fathoms, lying on the line of the lights in one, nearly 2 miles south-eastward of Lägerholm Light, until that light shows red, when bring the Solvesborg Range Lights in line 21° , which leads over a patch of $4\frac{1}{2}$ fathoms about 1,400 yards northward of the western buoy of Skintosa and toward the entrance to Solvesborg; it passes westward of Ledgrund, and when Timan Light changes from white to green prepare to sheer to starboard as soon as it changes to red to avoid the $2\frac{1}{2}$ -fathom patch with black and white spar buoy previously mentioned. After sheering to starboard steer for Timan Light, then round gradually to port, and anchor in the Outer Road in the green sector of Timan Light, bearing between 94° and 96° , with the rear range light (white) just open eastward of the front light (red).

Vessels from the eastward at night have only the light on Lägerholm to use as a guide. Having passed the shoals off the points eastward of the entrance to Solvesborg, steer for Lägerholm Light, bearing between 257° and 262° , and when Solvesborg Range Lights are in line proceed as above directed. Strangers are recommended to pass southward of Skintosa, not bringing Lägerholm Light to bear westward of 284° , and keeping within the white sector until Solvesborg Range Lights are in line, when proceed as before directed.

Solvesborg (Sölvesborg) **Harbor** has a depth of 17 feet at mean level, over mud and clay. The deepest draft that can enter is 16 feet. The length of quays is about 1,950 feet, with from 13 to 16 feet alongside at mean level, and there are three cranes of 6, 8, and 15 tons. The quays are partly furnished with railway lines, which also connect with the Inner Road. Ice obstruction occurs generally in January and February, but the port is kept open by an ice breaker. The difference between mean and low water levels is 2 feet.

The town of Solvesborg has about 1,200 inhabitants.

Communication.—There is a railway communication with Kristianstad and Karlshamn, etc., and by steamer with Stockholm and the southern Swedish ports. There is telegraphic communication.

Supplies.—Water can be obtained; also provisions and coal in small quantities.

Dock.—There is a dry dock at Solvesborg. (See Appendix I.)

Repairs can be effected to wood and iron vessels and machinery.

Trade.—The exports chiefly consist of granite, lumber, fire bricks, and kaolin; the imports of coal and grain.

A tug is available.

Sillnäs Point—Beacons.—Sillnäs Point, situated $1\frac{1}{2}$ miles south-eastward of Vestrånäs, has on it a pole beacon 47 feet high, with white boarding for about two-thirds of its height and a white triangular board as topmark; southwestward of the point, about 1,000 yards from the shore, there is a 2-fathom shoal, marked on its southwestern edge by a pole with upturned broom.

Torsö Point.—There is a red perch, with topmark near the edge of the Flädjan Shoal, extending from Torsö Point 1 mile eastward of Sillnäs Point.

Clearing marks.—Timan Lighthouse in line with Sillnäs Point Beacon leads southwestward, and Hanö Lighthouse in line with Kråk Point leads southeastward of Flädjan Shoal.

Lights.—Fishing lights, the northern fixed red and the southern fixed white, in line when bearing 346° , are shown from September 1 to April 30 at Torsö fishing village when the fishermen are at sea.

Hellevik, the entrance to which lies between Biark Point and Kråk Point, $1\frac{1}{2}$ miles eastward of it, is about $1\frac{1}{2}$ miles deep in a northerly direction; the eastern part of the bay is shallow, and the

channel leading to the anchorage lies about 600 yards from the western shore. There is anchorage in $3\frac{3}{4}$ fathoms outside the inner spar buoy, and in $2\frac{1}{2}$ fathoms farther in, sand bottom. This bay should only be used during offshore winds or in fine weather, as the holding ground is indifferent; it is inaccessible, on account of ice, from January to March and even April. Vessels entering obtain pilots by day from Hanö.

Water and some provisions can be had at Hellevik Village.

Buoys.—The shoal water on the eastern side of the bay is marked by two spar broom buoys, and on the western side by two plain black and white spar buoys, the outermost of the latter marking the southern end of a reef which extends nearly half a mile southward from Biark Point.

Light.—From a white circular tower, near Hellevik fishing station, at the head of the bay, a group flashing white light, with red and green sectors, is exhibited at an elevation of 26 feet above the sea. The white light shows in the entrance and is visible 10 miles, the red and green lights 8 miles and 6 miles, respectively. (For details see Light List.)

Storm signals.—A storm signal station has been erected on Stiberg, to the northward of Hellevik.

Kråk Reef and Westerås (Västerås) **Grund** extend $1\frac{1}{2}$ miles southwestward from Kråk Point. Westerås Grund, with 2 fathoms on it, consists of several shoals with deep channels between.

Buoy.—A red spar buoy, surmounted by a ball under an upturned broom, is moored in a depth of 4 fathoms near the southern edge of this grund.

Clearing marks.—Hanö Lighthouse, bearing 59° , or Ternö its own length open of Lister Head, leads southeastward, and Fielkinge Backe seen well open southward of Sillnäs Point, bearing 293° , leads southwestward of Westerås Grund.

Nogesund (Nogersund) fishing village, $\frac{3}{4}$ mile northeastward of Kråk Point, has a small harbor formed by two breakwaters, in which the depth is $8\frac{1}{2}$ feet at mean water level and $6\frac{1}{2}$ feet at low level over a bottom of pebbles. Fishing boats can not lie alongside the inner sides of the breakwaters.

Fishing light.—A fixed white light is shown at an elevation of 26 feet, from a standard on the outer end of the western breakwater, between September 1 and May 1, when fishing is going on.

Storm warnings are shown on a notice board at Nogesund.

Hanö Sund.—The coast from Kråk Point to Lister Head, $3\frac{1}{2}$ miles northeastward of it, is high and precipitous, with depths of 4 and 5 fathoms close to the shore; between this part of the coast and Hanö lies Hanö Sund, which is about 2 miles wide, with depths of 5 to 17 fathoms, sand and clay.

Dangers.—In the southern entrance to the sund, and about $1\frac{1}{2}$ miles eastward of Kråk Point, lies a sand bank, with a general depth of 2 to $2\frac{1}{2}$ fathoms and 5 to 13 fathoms close around; it is over a mile long north and south and 700 yards broad. On the southern part of the bank there is a rock with $2\frac{1}{2}$ fathoms on it, named Flading (Fladingen); about 800 yards northward there is another rock, named Guldgruf (Guldgrufvan), with 2 fathoms, and between these two is the shoalest spot on the bank, with $1\frac{1}{4}$ fathoms on it. There is a shoal spot on the north end of the bank.

Buoys.—A black and white spar buoy, surmounted by a ball, is moored on the eastern side of the shoalest spot of $1\frac{1}{4}$ fathoms. A spar buoy painted black and white, moored eastward of a shoal with a least depth of 15 feet, is 800 yards eastward of the shoal spot on the northern end of the bank.

Clearing marks.—Lister Head, bearing 357° , or Sternö, open two or three times its own length eastward of Lister Head, leads eastward of this bank, and Biorken Point well open southward of Kråk Point leads southward. At night the white sector of Ternö Light, bearing between 40° and 43° , leads southeastward of Flading and Guldgruf.

Approaching Hanö Sund from the southward the soundings are very irregular. About $3\frac{1}{4}$ miles south-southeastward from Kråk Point and 5 miles 205° from Hanö Light lies Ny Grund, with $5\frac{1}{2}$ fathoms. Bred Grund, with a depth of $3\frac{1}{4}$ fathoms, lies with Hanö Lighthouse bearing 337° distant $5\frac{1}{2}$ miles.

Between Bred Grund and Hanö lie Flis Grund, with a depth of 9 fathoms, and Sill Grund, with $6\frac{1}{2}$ fathoms.

Lister Head—Fishing light.—A fixed white fishing light is exhibited from a small white hexagonal tower on Lister Head, at an elevation of 49 feet above the sea; shown from March 15 to June 15. (For sector see Light List.)

Hanö is nearly $1\frac{1}{2}$ miles long, north and south, and $\frac{3}{4}$ mile across; the island is 197 feet high, and bare, with the exception of a few trees and bushes near the lighthouse, and has deep water around it, and may be approached to a distance of 400 yards. A low sand spit, named Bönsäcken, projects northwestward from the north point of the island, and is steep-to. At a fishing village on the west side of the island there is a small harbor, formed by two piers; the entrance is 22 yards wide, with a depth of 9 feet over some rocks; detached rocks lie farther in. Alongside the outer part of the southern pier the depth is 11 feet. About 1 mile northeastward of Hanö there is an isolated rock named Malqvärn.

Light.—A group flashing white light, elevated 231 feet above the sea, and visible 22 miles, is exhibited from a white concrete tower

52 feet high, situated on the summit of Hanö. (For details see Light List.)

Fishing light.—A fixed white and red light, elevated 13 feet above the sea, is exhibited on the northern pierhead at the village, west side of Hanö, from August 1 to December 31, and also when vessels or fishing boats are expected. (For sectors see Light List.)

Pilots.—Hanö is a pilot station: pilots wait on the northeastern coast of Hanö, in Nyland, and in Hanö Sund, and meet incoming vessels outside in open water, but can not be obtained at night. A black cone with a white band hoisted on the northeastern point of Hanö signifies that a pilot is there. Pilots for outward-bound vessels can be obtained by order from the pilot office in Hanö Sund or the observation post in Nyland.

Anchorage.—On the west side of Hanö, anchorage may be obtained in the depth of 12 to 14 fathoms clay, with the beacon on Matviks Hög, 3 miles east of Karlshamn, in line with Bönsäcken; or with Malqvarn Rock open north of Bönsäcken. Anchorage may also be obtained on the north side of Hanö in 11 to 12 fathoms, clay, with Kråk Point in line with Bönsäcken; there is a heavy swell in bad weather.

The coast from Lister Head trends north-northwestward for 8½ miles to Pukavik, thence easterly for 5 miles to Sternö Peninsula, forming a large bay, in which there are numerous rocks and shoals. About 6 miles north-northwestward of Lister Head there are some sandhills, covered with dense plantations, named Norge Böke, which form good landmarks for this part, and about 3 miles inland there is a range of hills named Ryssberget, 502 feet high, visible from a considerable distance seaward.

Laxgrund—Beacon.—Laxgrund, parts of which are awash, lies about 1 mile northeastward of Lister Head; it is about 600 yards in extent, and has on it an iron beacon with black triangular topmark; this beacon is removed during the winter and replaced early in the spring. About 700 yards northwestward of Laxgrund is a shoal 2¾ fathoms, ½ mile offshore. Between Laxgrund and the shore there are depths of 4 to 6 fathoms.

Buoy.—A black and white spar buoy, surmounted by two balls as a topmark, is moored on the eastern side of Laxgrund.

Clearing marks.—Kråk Point bearing 226°, or Ternö Light 52°, leads southeastward of this grund, and Hanö Light bearing 156° leads eastward.

Horvik.—From the northern part of Lister Head, a reef extends about ½ mile in a northerly direction, on the western side of which is Horvik, with a depth of 4 fathoms, sand, sheltered from winds between west and south. Fresh water can be obtained from a spring on the western side of this bay.

Harbor.—At the fishing village of Horvik is a harbor protected by two moles, the eastern of which, 286 yards long, extends in a north-northwest direction, and then turns west-northwestward; the western mole extends northeastward for 106 yards, and the distance between the mole heads is $29\frac{1}{2}$ yards. The depth in the entrance is $10\frac{1}{2}$ feet at mean water level, $6\frac{1}{2}$ to $9\frac{1}{2}$ feet alongside the east mole, and $8\frac{1}{2}$ feet at the west mole; the harbor shoals gradually to the beach. The harbor is closed by ice in January, February, and sometimes in March.

Light.—A fixed red light, elevated 14 feet above the sea, is shown on the east pierhead of Horvik. (For sector see Light List.)

This light is exhibited annually from August 1 to April 30, when the harbor is not obstructed by ice.

Supplies.—Some provisions, water, and a small quantity of coal can be obtained.

Trade.—Wrought granite is exported, and wood, salt, bricks, and firewood are imported.

Storm warnings are shown on a board at Horvik.

Pilots are obtained by day from Hanö.

Diupkaus (Djupekås) **Road**, situated about $2\frac{1}{2}$ miles north-northwestward of Horvik, affords good anchorage for small vessels, in from 6 to 26 feet water. The outer anchorage has a bottom of sand and stones; farther in it is mud. Small craft usually anchor in a depth of about 10 feet. Pilots are obtained by day from Hanö or Pukavik.

Örnåvik, about 7 miles north-northwestward of Lister Head, has good but contracted anchorage for small craft in $1\frac{3}{4}$ fathoms at mean-water level, with bottom of sand and clay. Vessels must have stern-fasts to the shore. There is a small pier, 23 feet long, with $8\frac{1}{2}$ feet alongside. Vessels of 15 feet draft can anchor about a mile to the southeastward sheltered from all winds. Some provisions can be had at Norge, about a mile off.

Pukavik.—Pukavik is situated at the head of the bay between Lister Head and Sternö and has in its sheltered harbor a depth of from 1 to 2 fathoms at mean-water level and about $1\frac{1}{2}$ feet less at low level, over sand and clay. The greatest depth that can enter is 11 feet. There are three small piers, alongside which vessels of $6\frac{1}{2}$ feet draft can secure. There is generally ice obstruction from January to March.

Dangers in approach—Buoys.—Rockegrund, awash, lies on the north side of the channel west-southwestward $1\frac{1}{2}$ miles from Sternö and is marked on its southern side by a red spar buoy, surmounted by an upturned broom over a ball.

The Storebåd, with 2 fathoms, also lies on the north side of the channel and is marked on its south side by a red spar buoy with up-

turned broom. About $\frac{1}{2}$ mile northwestward of Storebåd is a shoal of $1\frac{1}{4}$ fathoms marked on its west side by a similar buoy.

Kyrk (Kyrke) Grund, on the southern side of the channel, has $1\frac{1}{2}$ fathoms on it and is marked on its northern side by a black spar buoy surmounted by two balls; it lies 700 yards southward of Rockegrund.

Southwestward of Kyrk Grund are several shoals, with from less than 1 to 2 fathoms over them, marked on their northern side by a spar buoy with ball. Kladd Grund, about 1,200 yards south-southwestward from Storebåd, has 1 fathom over it.

Ulkan Grund, awash, situated about $1\frac{1}{4}$ miles from Pukavik Harbor, is marked on its northeastern side by a black and white spar buoy. For other shoals, see the chart.

Landmarks.—Southward of Pukavik Village is a high oak tree with two white boards, one on the top and the other in the middle of the tree. Wadholms (Vadholms) Sten is a large whitewashed rock on an islet near the shore southward of Pukavik Village. The above marks in line bear 318° .

Pilots.—Pukavik is a pilot station; pilots meet vessels from sea outside Ulkan Grund in the daytime. A stranger should take a pilot from Hanö or Karlshamn to conduct the vessel between the outer shoals until a Pukavik pilot comes on board.

Road.—The road outside Rönholm has depths of from $3\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, sand, and is accessible by vessels of 14 feet draft. It is open to winds from the southeast quarter.

Directions.—A stranger bound to Pukavik should not proceed westward of Kofsa Oak in line with a white spot on a low hill by the beach, bearing 7° , until a pilot is obtained. The oak is on the north coast, westward of Sternö, and being higher than the other trees is conspicuous.

When approaching Pukavik steer to bring Sternö Point to bear 37° , distant about $1\frac{1}{4}$ miles, and one of the following marks on, either Södra Särdaalen, a noticeable depression in the Ryssberget, over Norge Böke, a beech wood on the shore, a quarter of its length from the north end, bearing 274° , or, if the Ryssberget can not be made out, the southern hillock on Skallö, an islet close northward of Ternö, between the large and small oaks on Harö, northeastward of Ternö, bearing 85° . Steer in on the first mark, or with the second mark astern, between Rockegrund and Kyrk Grund, and when the oak tree at Pukavik comes in line with the Wadholms Sten, 318° , steer in on that mark, which leads toward Pukavik. Outside Ulkan a Pukavik pilot is taken, or the vessel can anchor $\frac{1}{2}$ mile outside the spar buoy, in from 7 to 8 fathoms, loose bottom. There is a channel on each side of Ulkan Grund; the western also leads to Örnävik. When approaching the road or harbor broom spar buoys are left to starboard and plain spar buoys to port.

Supplies—Trade.—Provisions and water can be had, but no coal or other ship's stores. There is a small yard where wooden vessels can be repaired. The nearest telegraph and railway are at Sandbäck, over $1\frac{1}{2}$ miles off. Wrought granite is exported.

Coast.—Between Pukavik and Sternö Peninsula there are several small inlets where landing can be effected, but numerous shoals lie in the approach to them, for which see the chart.

Elleholm, $2\frac{1}{4}$ miles eastward of Pukavik, has well-sheltered anchorage in $1\frac{1}{2}$ fathoms, sand, mud, and clay. A pilot is absolutely necessary and can be obtained by day from Pukavik. Water can be had. Potatoes, manure, and feeding stuffs are imported.

Gunön, in the bight eastward of Elleholm, has $4\frac{1}{2}$ fathoms at the anchorage, bottom sand and rock. There is a jetty 27 yards long, with from 13 to 15 feet alongside. Vessels of 15 feet draft up to 200 feet in length can enter; those from sea obtain pilots from Karlshamn, and those leaving from Pukavik. Stone is exported. Water can be had.

Stilleryd, 1.4 miles westward of Karlshamn, has sheltered anchorage in $2\frac{3}{4}$ fathoms, sand and clay; farther in the depth is 2 fathoms. Vessels of 15 feet draft can enter. There are four short jetties, with from 5 to 13 feet alongside. Pilots are obtained from Karlshamn. Water can be had. Stone is exported.

Karlshäll, situated on the southern shore of the bay which penetrates deeply on the west side of Sternö, has well-sheltered anchorage in $4\frac{1}{2}$ fathoms, mud. There are two small jetties, with 17 and $15\frac{1}{2}$ feet alongside. Water can be obtained. Stone is exported. Pilots are obtained from Karlshamn.

In Sandvik, on the western side of Sternö, there is a small jetty with $9\frac{1}{2}$ feet alongside, but vessels can not lie there with strong southwest and west winds.

Karlshamn.—The entrance to Karlshamn may be recognized by Sternö Peninsula on the western, and Ternö (Tärnö) on the eastern side; this island is tolerably high, with a bare summit surrounded by a plantation. The width at the entrance, between Sternö and Enskär, is nearly $1\frac{1}{4}$ miles, whence it extends $1\frac{1}{2}$ miles northward, narrowing gradually.

Beacon.—On the east side of the entrance, $2\frac{1}{4}$ miles northwest of Ternö, lies a small, low island, partially wooded, named Enskär, having on it a white stone cairn beacon 10 feet high, fitted with a pole and barrel as topmark; and on the same side of the harbor, farther in, are the islets named Yttre and Inre Ortholm; on the latter is a small light tower. On the west side of the harbor, $\frac{1}{4}$ mile within the entrance, is Boön, an island $\frac{1}{2}$ mile long north and south, and separated from Sternö by a channel 200 to 400 yards wide. In the middle of the harbor, and southward of the town, from which

it is separated by a channel 250 yards wide, with a depth of 3½ fathoms, is Karlsten, occupied by a fort.

Dangers—Buoys—West side.—On the west side there are several shoals, extending 1,600 yards from the shore.

Yttre Lak Knallar, the southernmost, has 4½ fathoms on it.

Läk Knallar, 400 yards northward, has 5 feet water, and its eastern part, named Elleskärs Head, is marked by a black buoy, surmounted by a ball.

On the north extreme of Lak Knallar is Fransbåde, with a depth of 1 fathom on it.

Westward of Fransbåde, Flatskär, above water, extends 400 yards south-southeastward from the Sternö Shore.

Elleskär, a rock above water, lies about 600 yards southeastward from the southern end of Boön.

Åsehufvud, a shoal with 2 fathoms on it, lies ¼ mile eastward of Boön, and is marked on its northeastern side by a black and white spar buoy. It lies on the southern end of a bank about 800 yards long north and south, on which are the two following shoals:

Rödasten, with 1½ fathoms, is marked on its western edge by a red spar buoy with upturned broom. It lies about 400 yards northward of Åsehufvud.

Lassebåd, with 2½ fathoms, lies 200 yards northward of Rödasten, and is marked on its northern side by a black and red spar buoy, with cross.

Svartskärsgrund.—Several rocks and shoals extend about ¼ mile in a southerly direction from Fort Karlsten; the southernmost is named Svartskär, and is above water, as is also Flateskär, farther north. Svartskärsgrund, less than 200 yards northeastward of Svartskär, has 1 fathom on it, and is marked on its eastern side by a black and white spar buoy.

East side.—Between Ternö and Enskär, on the eastern side of the approach to Karlshamn, there are several shoals of 5 fathoms and under, the most important of which is Garnagrund, with 2½ fathoms on it, lying southeastward 800 yards from Enskär.

Enskär, already described, is surrounded by shoal water, which extends about 200 yards westward and southwestward toward the entrance channel.

Lights—Ortholmen.—From a small white circular tower on masonry base, on the southwest point of Inre Ortholmen, an islet, situated on the eastern side of the entrance to Karlshamn, at the elevation of 19 feet above the sea, an occulting white light is exhibited, visible 7 miles. (For details see Light List.)

The light is unwatched, and therefore should not be implicitly relied on. The rock under the lighthouse is white.

Breakwater.—From the southwest end of the breakwater at Karlshamn, at an elevation of 19 feet above the sea, a fixed green light is exhibited. (For sector see Light List.)

Range lights.—At the southern end of the town, on the quay, 17 feet above the sea, a fixed red light is exhibited, and 228 yards 341° from this light another fixed red light, at an elevation of 38 feet above the sea, is shown: these are range lights exhibited when the harbor is free of ice. (For details see Light List.)

Harbor.—Karlshamn has a good harbor, sheltered by a breakwater built in a southwesterly direction; it is singularly free from ice, and navigation is open all the year round. The depths are from 18 to 26 feet, with a bottom of clay, mud, and pebbles. The quays are furnished with railway lines; the west quay is 465 yards long with a depth of 15 to 16 feet alongside, and the east quay has a length of 492 yards with a depth of 15 feet. There are two wharves with 18 feet alongside, and at the petroleum wharf, the outermost on the west side of the harbor, vessels drawing 23 feet can secure. The above depths are at mean water level; the difference between that and the usual low level is only from 1 to 1½ feet, but in spring and autumn, in an exceptional case, the difference may amount to 5 feet.

There are two cranes lifting 10 and 20 tons.

Pilots.—Vessels are met by pilots outside the Lak Knallar Bank. Pilots for outward-bound vessels can be obtained by application to the Karlshamn Pilot Station.

Anchorage.—In the road northwestward of Karlsten, the depths are 3¾ to 6½ fathoms, clay, well sheltered from all winds, but a swell sets in with a southerly gale.

In the winter harbor (Windhamn) (Vindhavn) between Boön and Sternö, there is good anchorage in 3¾ fathoms, clay; vessels drawing 12 feet can enter Windhamn from the northward.

Good anchorage may be obtained northward of Boön Island in a depth of 6½ to 7½ fathoms.

Directions—By day.—When bound to Karlshamn, after passing Ternö (Tärnö), and when within 3 miles of the town, bring the western high church spire well open eastward of Karlsten, bearing 342°, or the same spire midway between Karlsten and Inre Ortholmen 339°, either of which leads clear of all dangers. Pass eastward of Karlsten at a distance of about 200 yards, and when abreast its northern end steer northwestward for the anchorage in the road, avoiding a red spar buoy with broom outside the end of the breakwater, or round the latter into the harbor.

If the pilot is unable to come out, the above directions may be followed without danger.

There is another channel leading to the harbor close to Boön Island, but it should not be attempted without local knowledge.

At night.—Before Ternö (Tärnö) Light changes from red to green, on a 98° bearing, bring the two fixed red range lights in line 342° or open Ortholmen Light. This mark must be strictly preserved until Karlsten is passed and the northwest sector of white light from Ortholmen is entered about 350 yards from the green light on the breakwater. Then steer northwestward for the anchorage in the road or round the green light into the harbor, in both cases remembering the broom buoy about 77 yards southward of the light.

Coming from the eastward, the south point of Ternö should not be approached nearer than $\frac{1}{2}$ mile.

Karlshamn town is situated at the mouth of the Mie River. It has two towers; the eastern or bell tower is painted white, and the western church has a cupola with spire. These towers are easily distinguished from seaward. Karlshamn contains 7,288 inhabitants.

Repairs.—At Windhamn (Vindhamn) (Winter Harbor) inside Boön, about 1 mile southward of Karlshamn Harbor, there are a building yard, machinery workshop, sheers to lift 20 tons, and a patent slip. See Appendix I.

Supplies.—Provisions, coal, and other supplies can be obtained.

Communication.—There is telegraphic and railway communication and regular steamer communication with Stockholm, Göteborg, and places between.

Tugs are available.

Harbor regulations.—Vessels arriving are warned that they must carry out accurately all the regulations regarding quarantine, customs, and pilotage, and also the other rules regarding navigation. Colors must be kept flying until after the customs examination, when report must be made to the harbor master except in the case of men-of-war and certain special vessels, which will be visited and given a copy of the port orders.

Vessels arriving must not anchor farther up the harbor than opposite the center of the northern bay of Espinghamn, taking care to leave the channel clear. They may not lie at anchor for more than 24 hours after arrival without permission, during which time a watch must always be provided.

The vessel must be moored at the berth allotted, and may not move without permission, but she may be required to shift berth by the harbor master. When warping in the harbor a harbor pilot must be on board.

Vessels lying alongside must provide fenders, and if required run in jib booms, brace and top yards, etc. If gangways are used, they must be fitted with scotchmen to prevent damage to the quay.

Provision must be made when working cargo or ballast to prevent anything falling into the harbor, and no rubbish may be discharged into the harbor.

No hawsers or warps may be laid out without permission, in which case a watch must be set on them, and at night the position of the warp marked by lanterns.

Steamers, when passing lighters, vessels beating to windward, repair rafts, opening bridges, etc., must reduce speed, so that no damage is done, and when going alongside or leaving quays speed must not be greater than necessary for maneuvering.

Engines must not be worked when alongside until the vessel's stern has been hauled off to a sufficient distance to prevent damage to the quay wall.

Funnels may not be swept between 5 a. m. and 10 p. m. Steam whistles may not be used in the harbor unless necessary to avoid danger.

For further regulations, and for prevention of fire, etc., see the regulations as published by the harbor authorities.

Exports and imports.—The exports consist of stone, timber, wood pulp, pitch, and tar, and the imports chiefly of coal, manure, salt, grain, tobacco, cotton, oil cake, and bran.

Ternö (Tärnö) Harbor, situated on the north side of Ternö Island, affords secure anchorage for five or six large vessels in a depth of 5 to 5½ fathoms, sand and clay. The entrance lies between the northeastern extremity of Ternö, and Harö, a small island nearly ¼ mile northeastward of it; the passage is only 131 yards wide and is suitable for vessels of 17½ feet draft. There is another entrance northwestward of Ternö, suitable for vessels drawing 11 feet, but it should not be attempted without local knowledge. The difference between mean water level and ordinary low level is 2 feet. There is a small wharf with 15½ feet of water alongside. Ice obstruction occurs usually from January to March. Water can be obtained.

Light.—From a white octagonal tower, 19 feet high, on Drakberg (Ifberg), the south point of Ternö (Tärnö), is exhibited a group flashing white light, with red and green sectors, elevated 102 feet above the sea. The white light is visible 12 miles, the red light 8 miles, and the green light 7 miles. (For details, see Light List.)

Pilots.—Ternö (Tärnö) is a pilot station; pilots can be obtained by day.

Pilots meet vessels from seaward outside the shoal, and those using the reef channel in the channel. No lookout is kept during darkness.

Directions.—Approaching the eastern entrance to Ternö (Tärnö) Harbor, steer for the beacon on Matviks Hög, bearing 346°, the beacon will then be seen between Harö and Stora Ekö, which will be recognized by a large white rock on the east point of the island; and when

abreast the south extreme of Ternö, bring the beacon between Stora Ekö and Joggesö, but to clear Tjufnabbs Reef, which extends from the northeastern point of Ternö and is marked by a black buoy with a ball top mark. Matviks Hög Beacon should not be brought in line with the large rock on Stora Ekö. When past Tjufnabbs Reef Buoy steer northwestward toward the anchorage 200 yards eastward of the small Ebbeskär, which lies in the middle of the harbor northward of Ternö and divides it into two parts. To enter the more roomy part of the harbor westward of Ebbeskär pass northward of that rock, the reef off the north point of which is marked by a black and white spar buoy, and southward of a red broom buoy northwestward of Ebbeskär marking a skerry on the north side of the harbor; having passed these, steer southwestward for the anchorage.

Bokö and Matvik Anchorages lie between the islands north of Ternö and the mainland. Matviks Fjärd, or harbor, with depths of from 5 to $6\frac{1}{2}$ fathoms, lies near the mainland; southward of, and separated from it by the Bokö Islands, is Bokö Fjärd, with depths of from 6 to $7\frac{1}{2}$ fathoms over clay. These anchorages are capacious, and afford swinging room for a large number of vessels. Ice obstruction occurs generally from January to March.

The western entrance to the anchorages from Karlshamn lies north of Enskär, and is available for vessels of 25 feet draft at low water level and 27 feet at mean level, but should not be attempted without a pilot or local knowledge; the eastern entrance, which is common to both Fjärds, and available for vessels of 25 feet draft at mean water level, lies about $1\frac{1}{2}$ miles northeastward of Ternö, between Bockö and Miö.

Beacons.—On Bockö, western side of the eastern entrance, stands a white cairn 6 feet high, and on Färö, about $1\frac{1}{4}$ miles northward of Bockö, and on the northern side of the channel leading to Matviks Fjärd, there is a white cairn, 12 feet high, surmounted by a black horizontal cask.

Matviks Hög Beacon, standing on the highest summit of a thinly-wooded hill north of Matviks Harbor, is a red pole beacon, 59 feet high, with a square black board as top mark.

Directions.—Approaching the eastern entrance, the shoals extending from Harö will be avoided by keeping Lister Head open southward of the southern extremity of Ternö, and Matviks Hög Beacon seen between the beacons on Bockö and Färö, but nearer the latter and over the middle of Färöholm, an islet west of Färö, bearing 323° , will lead eastward of the shoals on the western side of the fairway, and westward of Fjördbrikan Shoal, with 17 feet water, marked by a spar buoy and cross, thence to the northwestward and westward for the anchorage in a depth of 5 to 8 fathoms, clay, in the middle of Bokö Fjärd.

To enter Matviks Fjärd, as soon as Fjordbrickan Shoal is passed, steer for Matviks Hög Beacon, seen over the opening between Färö and Färöholm, which leads eastward of the reef extending from the eastern Bokö Island, marked by a black and white spar buoy; then turn more westward to bring Färöholm and the red broom buoy on the edge of the shoal off it on the starboard hand, after which steer westward to the anchorage in the fjärd.

Pilots meet vessels outside the banks and inside the fairway during daylight; they may also be obtained from Ternö and Bockö by day.

Matvik, on the west side of the fjärd of that name, lies about $3\frac{1}{2}$ miles eastward of Karlshamn; it is sometimes visited by coasting steamers during the navigation season. At the loading pier at Matvik the depth is 12 feet, and the dredged channel leading to it has a depth of 13 feet.

Fresh water can be obtained from the Trenså River, which discharges in the northeast angle of Matviks Fjärd. Some supplies may be had in the neighborhood.

The coast from Karlshamn trends in an easterly direction 33 miles to the entrance of Kalmar Sound, and is wooded in most parts. As the navigation of this part of the coast is so intricate, a general description only of the most important islands, ports, and anchorages will be given.

Caution.—There are numerous outlying rocks and shoals the whole distance, and vessels should not approach the land within a distance of 3 miles without a pilot.

Guevik, at the northern end of the bay of the same name and $5\frac{1}{2}$ miles eastward of Karlshamn, has two loading jetties with $7\frac{1}{2}$ and $8\frac{1}{2}$ feet of water alongside them. Vessels drawing 17 feet can approach to within $1\frac{1}{2}$ miles, but they must moor head and stern, as there is no room to swing. Water and a few provisions may be had. Pilots are obtained by day from Ternö.

Jernavik Fjärd, situated about 4 miles northeastward of Ternö (Tärnö), affords good anchorage in a depth of 6 to 8 fathoms on the east side of Tjärö.

Beacons.—The south extreme of Tjärö has on it a low white stone beacon, 59 feet above the sea.

On a point of the mainland, southeastward of Tjärö Beacon, is a large whitewashed rock.

Jernavik, at the northern end of Jernavik Fjärd, has anchorage off it in $3\frac{1}{2}$ fathoms, sand and clay. There is a loading jetty 56 feet long, with a depth of $7\frac{1}{2}$ feet alongside; timber is shipped here.

Ice obstruction occurs from January to March. Water and some provisions can be obtained.

Pilots are obtained by day from Ternö.

Directions.—From seaward, follow the directions given for approaching Matvik, and before Lister Head touches the south point of Ternö, steer 24° , which course leads to the entrance of Jernavik. When passing Eldskär, to the southward of Tjärö Beacon, keep a little to the eastward to avoid the reef extending from that skerry. When a small dark rock northeastward of Tjärö Beacon, named Yttre Gåse, is made out, steer for it in a 22° bearing, and pass eastward of it, after which anchor as convenient either eastward of Tjärö or farther in off Jernavik.

Bjernövik, a short distance westward of Jernavik, has good anchorage in about $3\frac{1}{4}$ fathoms, mud; vessels moor head and stern. There are two small loading jetties, with 10 and $8\frac{1}{2}$ feet of water alongside; stone is shipped. Water can be obtained.

Edstorp, in a bay north-northwestward from Jernavik, has anchorage in about $3\frac{1}{4}$ fathoms, mud. There are two small loading jetties, with $8\frac{1}{2}$ feet of water alongside; stone is shipped here. Water is procurable. For pilots and directions, see Jernavik.

Fishing light.—On Hvitaskär, eastward of the approach to Jernavik, from a stone house, and at the height of 30 feet above the sea, a fixed white light is exhibited during dark nights, when the fishermen are out.

Approach to Ronneby Road.—**Ekö Island** is $5\frac{1}{2}$ miles eastward of Jernavik, and about $\frac{1}{2}$ mile from the shore; on the highest cliff of this island is a large white patch, which may be seen from a considerable distance seaward. There is anchorage off the northern side of Ekö Island in 5 to 6 fathoms, sand and clay.

Gåsfeten, a small but tolerably high rock of a yellow appearance, lies about 1 mile southward of Ekö Island.

Hvitaskär.—A shoal with $2\frac{1}{2}$ fathoms lies about $2\frac{1}{4}$ miles south-southeastward of Hvitaskär, and 3 miles west-southwestward of Gåsfeten, in the approach to Ronneby; this shoal is marked close to its southern side by a red buoy with a ball over an upturned broom.

Light.—On Gåsfeten, an unwatched flashing white light with red and green sectors, is exhibited from a small white iron tower, at an elevation of 28 feet above water. The white, red, and green lights are visible 9, 6, and 5 miles, respectively.

Gjö (Gjö) is a wooded peninsula situated $2\frac{1}{4}$ miles eastward of Gåsfeten, and has a dark appearance; Gjö Point is wooded. On the western extremity of this peninsula, named Gjökalf, there is a pilot station, with a lookout 39 feet high.

Beacons.—On Mulaberg, a small rock 16 feet high, a short distance southwestward of Gjökalf, stands a white cairn, 8 feet high and 16 feet above the sea. On Little Ekö, 1 mile northward of Gjökalf, there is a white cairn with diagonal red band.

Ronneby Road, on the northern side of Giö (Gjö) Peninsula, affords good anchorage in a depth of $3\frac{3}{4}$ to 5 fathoms, clay bottom. From sea, three channels lead into the entrance; the western lies eastward of Västra Fitiakullen and westward of Sommargrund and Östra Fitiakullen; the second lies westward of Gåsfeten and joins the first to the eastward of Ekö Island, whence it leads inward, passing westward of Dunsö; and the third, named Danzigergatt, leads along Giö, past Gjökalv. The two first are available for vessels of 19 feet draft at mean water level, and 17 feet at low level; Danzigergatt for vessels of 3 feet less draft.

Dangers—Buoys.—The following are the outer dangers at the entrance to Ronneby Road.

Västra Fitiakullen, with 2 fathoms on it, lies over a mile 256° from Gåsfeten, and is marked on its eastern side by a black spar buoy with ball.

Stora Grund, with 1 fathom on it, 1,400 yards northward of Västra Fitiakullen, and is marked on the eastern side by a black and white spar buoy. Between Västra Fitiakullen and Stora Grund is a patch of 2 fathoms.

Sommargrund, with $1\frac{1}{2}$ fathoms, lies nearly a mile 239° from Gåsfeten, and is marked on its western side by a red spar buoy, with downturned broom over a ball.

Östra Fitiakullen, with about 7 feet on it, lies $\frac{1}{2}$ mile westward of Gåsfeten, and is marked on its westward side by a red spar buoy with upturned broom.

Eskelens Grund, with 10 feet on it, lies over $\frac{1}{2}$ mile northeastward of Östra Fitiakullen, and is marked on its west side by a red spar buoy with upturned broom.

Shoals.—Two shoals, of $3\frac{1}{2}$ and $3\frac{3}{4}$ fathoms, lie about 800 and 1,200 yards, respectively, northward of Östra Fitiakullen, and in the western track to Ronneby.

A shoal of $2\frac{1}{2}$ fathoms, lying about 600 yards south-southeastward from Ekö Island, is marked on the western side by a red spar buoy with upturned broom, and on the northeastern side by a black and white spar buoy.

Slånakullen, with $1\frac{1}{2}$ fathoms, lies 1,400 yards southward of Gåsfeten, and is marked on its southern side by a red spar buoy with upturned broom over a ball. Ekö Island open westward of Gåsfeten, leads westward of the shoal.

The two channels westward of Gåsfeten lie between the above-mentioned dangers.

Kalfgrund, with $1\frac{1}{2}$ fathoms on the eastern side of entrance to Danzigergatt, is marked by a red spar buoy with upturned broom over two balls on the southern, and by a red spar buoy with upturned broom on the western side. Kalfgrund has extended south-

ward and eastward with a least depth of 17 feet. Little Ekö Cairn open westward of Gjökalv, 353° leads westward of the shoal.

A shoal, with a depth of 16 feet is located in the entrance to Ronneby, in (approximately) latitude 56° 07' 12'' N., longitude 15° 17' 06'' E.

The shoal is marked on the western side by a spar buoy with broom and on the northeastern side by a spar buoy without a topmark.

Kullen, a shoal of 3 fathoms, marked by a spar buoy with cross, lies nearly a mile east-southeastward of Kalfgrund, about 1,200 yards westward of the latter is a shoal of 4½ fathoms, and about the same distance farther in the same direction is a patch of 3 fathoms.

Ellebädan Shoal, with depth of 14.7 feet, extends 273 yards south-westward.

Approximate position of black buoy on shoal, latitude 56° 07' 50'' N., longitude 15° 17' E.

Shoals, with least depths as given below, have been discovered in the approach to Ronneby:

- 20 feet, in (approximately) latitude 56° 07' 45'' N., longitude 15° 12' 28'' E.
- 22 feet, in (approximately) latitude 56° 07' 53'' N., longitude 15° 12' 50'' E.
- 17.7 feet, in (approximately) latitude 56° 09' 45'' N., longitude 15° 14' 41'' E.
- 20.9 feet, in (approximately) latitude 56° 09' 15'' N., longitude 15° 15' E.
- 18.7 feet, in (approximately) latitude 56° 06' 40'' N., longitude 15° 18' 20'' E.
- 18.7 feet, in (approximately) latitude 56° 07' 15'' N., longitude 15° 17' 08'' E.
- 16 feet, in (approximately) latitude 56° 07' 19'' N., longitude 15° 17' 10'' E.
- 17.3 feet, in (approximately) latitude 56° 07' 30'' N., longitude 15° 16' 45'' E.

A shoal, with a least depth of 15.7 feet, is located in (approximately) latitude 56° 06' 40'' N., longitude 15° 08' 30'' E.

A red buoy with ball and upturned broom below the ball has been moored southward of the shoal.

Many other spar buoys are placed on the various shoals in the approach to Ronneby. The navigation of the channels is much simplified by the leading lights for them, described below.

Lights.—Besides Gäsfeten Light, previously mentioned, the following unwatched lights are exhibited (except when ice prevents navigation) at the undermentioned positions in the approach to Ronneby:

Saxemara Range Lights.—Front light, fixed white, elevated 10 feet above the sea and visible 7 miles, is exhibited from a red wooden house with white gable toward the fairway, situated on the western side of Bussesjär, northwestward of Dunsö.

Rear light, group occulting white, elevated 34 feet and visible 7 miles, is exhibited from a red wooden tower with white gable and two red bands, situated on Bossklimp and 1,312 yards 17° from the front light. These lights in line lead in the channel westward of Gäsfeten until southeastward of Ekö Island. (For details see Light List.)

Svanvik Range Lights.—Front light, fixed red, elevated 10 feet and visible 4 miles, is exhibited from a red wooden house with white gable, situated on the southeastern side of Funkö, northward of Dunsö.

Rear light, fixed red, elevated 29 feet and visible 4 miles, is exhibited from a similar house situated on the northwestern side of Harö and 612 yards 28° from the front light. These lights in line lead from southeastward of Ekö Island to Dunsö Bank.

Yttre Stekö Light, fixed, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, and elevated 8 feet, is exhibited from a red square wooden house having a white gable with a red band, situated on the southern end of Yttre Stekö. (For sectors see Light List.) The white sector leads between Dunsö and Funkö.

Aspan Light, on the eastern side of Ronneby Road, is fixed white, visible 6 miles, and is shown 8 feet above the sea from a red square wooden house, having a white gable with red band. (For sector see Light List.)

Gjöholm Light, situated on the southern shore of Brunnsvik, 580 yards 88° from Aspan Light and exhibited from a similar building at a height of 20 feet, is alternating white and red, visible, respectively, 6 and 4 miles. Aspan and Gjöholm Lights in line lead through the buoyed channel southward of Yttre Stekö.

Sandvikens Light, occulting, white with red and green sectors, is exhibited at an elevation of 13 feet above the sea, from a red square wooden house with white gable, situated on the northeastern shore of Ronneby Entrance; the white light is visible 6 miles, the red 4, and green 3 miles. (For details, see Light List.) The white sector leads up to the harbor

Ronneby Pier Lights are 2 fixed red lights shown from posts with triangular white boards 371 yards apart, at the heights respectively of 28 and 46 feet above the sea. In line, 0° , they lead from a position within the white sector of Sandvikens Light up to the pier.

Light buoy.—A red gas buoy, exhibiting a group flashing white light, showing 2 short flashes in quick succession, every 4 seconds, is moored off the northwestern side of Dunsö to indicate the bend of the fairway at this part.

When necessary, on account of ice, the lightbuoy will be replaced by a red buoy with an upturned broom.

Gunnery practice.—A long-distance range has been established to the westward of Hasselö, and in connection with this the following marks have been erected. A white board, tapering upwards, 13 feet high and 7 feet in mean width, with black ball on top, over a white patch on Stora Björkskär, which is situated about $\frac{1}{2}$ mile westward of Ekö Island. A white board, 10 feet broad and 6 feet high, is secured to the crown of a large oak on Gjöholmsland, northeastward

of Gjö Point. A triangular white mark, point downwards, supported by uprights, rests over a white patch on Lämman Rock between Lindo Point and Gjö Point.

Pilots.—Gjökalf is a pilot station; pilots are obtained thence or from Ekö Island and also meet vessels outside the outer shoals and in the channel inside the islands by day only.

The pilotage charges from Ekö Island to Ronneby Roads range from 25 kroner for vessels of 500 to 600 net register tons up to 50 kroner for vessels of 2,000 tons and over. From Gjökalf to the roads the charge is about 25 per cent more.

Directions.—To enter Ronneby Road by the westernmost channel, steer for the white patch on Stora Ekö on a 28° bearing, or with the white patch in line with the high water tower at Ronneby, either of which leads westward of Sonmar Grund, Östra Fitiakullen, and Eskelens Grund, and eastward of Västra Fitiakullen and Stora Grund, all of which dangers are marked by buoys. Having passed Eskelens Grund Buoy, or when Eskenlen Rock, small and dark, is well open southward of Gjö Point, steer to pass 300 yards southeastward of Ekö Island between the rather wide reef extending from that island and the $2\frac{1}{2}$ -fathoms shoal to the southward, previously mentioned; afterwards steer for Dunsö until the Svanvik Range Lighthouses are in line, when follow the directions given below; or round the eastern end of Ekö Island from the eastern and northern sides of which the reef does not extend more than 150 yards, and anchor northward of that island in 5 or 6 fathoms. Vessels without local knowledge, and unable to obtain a pilot, should not proceed farther than this anchorage.

To enter westward of Gåsfeten steer for the white patch on Ekö Island on a 7° bearing which leads westward of Slänakullen and Gåsfeten and eastward of Östra Fitiakullen; Ekö Island, open westward of Gåsfeten, also leads westward of Slänakullen.

Pass westward of Eskelens Grund and proceed to the anchorage north of Ekö Island. Or, when 3 miles distant from Gåsfeten, bring the Saxemara Range Lighthouses or Lights in line bearing 17° , and steer for them until Svanvik Range Lights are in line bearing 28° , which latter course leads westward of Dunsö, leaving to port the before-mentioned $2\frac{1}{2}$ -fathoms shoal, marked by two buoys, also the shoal southward of Busseskär marked by two spar buoys, one with broom and the other with ball. When Dunsö Beak Lightbuoy is on the starboard beam, turn to starboard and steer about 66° for Yttre Stekö Lighthouse, or white light, leaving a black and white spar buoy southward of Funkö to port. When Aspan and Gjöhölm Lighthouses or Lights come into line bearing 88° , steer for them, leaving 3 red broom buoys to starboard and 5 black and white

spar buoys to port. When well past the third red broom buoy, northeastward of Lindeskär, steer for Sandvikens Light, leaving 2 red broom buoys on Grefvinnan Shoal (6 feet) to starboard, and 4 black and white spar buoys, marking a 2-foot shoal, to port. At night, with Aspan and Gjöholm Lights in line, turn to port as soon as Sandvikens red light is seen, only remembering that the vessel must be in the white sector of that light when Aspan Light is obscured on a 99° bearing. When Ronneby Pier light posts or lights are in line steer up to the pier.

When proceeding outward at night, vessels may pass from the white into the red sector of Sandvikens Light as soon as Aspan Light is sighted, thereby rendering the turn into the Aspan-Gjöholm line of lights less sharp.

Eastern Entrance or Danzigergatt.—When approaching this entrance, Little Ekö Cairn, just open westward of Gjökalv bearing 353°, leads westward of Kalgrund, and clear of but near the outer shoals in this channel, for which a pilot should be employed.

Harbor.—On the east side of the mouth of the river is a quay 132 yards long, which is prolonged southward by a pier 148 yards in length. From the pier end, for a distance of 142 yards inward, the depth alongside is 17 feet at mean level, and from 16 to 12 feet alongside the remainder of the quay. On the east side of the pier a quay constructed along the shore has a depth of 17 feet alongside. On the west side of the river entrance is a quay 206 yards long, furnished with railway lines, with from 12 to 16 feet alongside at mean water level. The depth in the river within the entrance is 6 feet, and only steam launches and small craft can enter. A dredged channel 547 yards long and 76 yards wide, with a least depth of 17 feet at mean level, leads in a 0° direction to the pier end. The pier light posts or lights in line lead through. Farther out, in Ronneby Road, the depths are from 3½ to 5 fathoms, clay.

Ronneby, a small town with about 1,900 inhabitants, is situated on the river of the same name about 2½ miles from its mouth. It has famous mineral springs and baths.

Communication.—There is telegraphic and railway communication both at the harbor and the town. The regular steamers from Stockholm to Copenhagen and Christiania call here. Regular steamboat communication is maintained in summer between the town and the harbor.

Trade.—The chief exports are oats, castings, sheet iron, nails, timber, cardboard, and pulp; imports are coal, coke, and pig iron. The town contains sugar, leather, and soap factories.

Supplies.—Some ship's stores, provisions, and a small quantity of coal can be obtained.

Coast.—From the small peninsula of Lindö, east-southeastward of Giö (Gjö), to Torhamns the coast forms a large basin, in which the greatest depth is nearly 15 fathoms, sheltered from the sea by the large islands Hasselö, Aspö, Tiurkö (Tjurkö), Storkö (Sturkö), and Utlängan. Between these islands, and also inside and outside them, lie numerous islets, rocks, and shoals.

In about the middle of the basin are the naval port and town of Karlskrona, built on several islands near the mainland, and accessible from sea by several channels.

The passage between Hasselö and Aspö and that between Tiurkö and Storkö are closed by under-water dams.

The coast of the mainland is mostly wooded; the islands are low and difficult to distinguish one from the other. On Aspö and Tiurkö are fortifications.

Detached dangers extend to a distance of about 2 miles from the above-mentioned islands, but only those lying in the vicinity of the entrances will be described.

Kuggeboda Harbor, on the mainland west of Arpö, has a depth of 15 feet at mean water level, mud bottom.

Fishing light.—A fishing light is shown on Stora Smedjeholm, south of Kuggeboda harbor.

Arpö Harbor, eastward of Arpö, has a depth of 14 feet over mud. Stone and wood are shipped at both these places.

Pilots.—Arpö is a pilot station; the pilots attend on Hasselö by day, and for the above places may be obtained outside the outer shoals.

A spar buoy has been established southeastward of Arpö in (approximately) latitude $55^{\circ} 07' 22''$ N., longitude $15^{\circ} 25' 47''$ E.

Approach to Karlskrona—Gunnery practice.—A long-distance range has been established to the northwestward of Utklippan. In connection with this, the following marks have been erected: A white board tapering upwards, 29 feet high, and a mean width of 14 feet, situated on the southeastern shore of Södra Bollö. A white triangular mark, point downwards, over a board, tapering upwards, 9 feet high, with a mean width of 11 feet, on Kråkan, a rock about 1,800 yards off the southwestern shore of Storkö. A black square board, about 6 feet across, with one corner pointing upwards, over a white board, tapering upwards, 14 feet high and 16 feet mean width, erected on Hannisken (Harnesken) Rock. Two marks on Utklippan, the northern consisting of a pole surmounted by two triangular boards, apex downwards, about $6\frac{1}{2}$ feet long in the sides, the upper one being white and the lower black. The southern mark consists of a pole, with two circular disks $6\frac{1}{2}$ feet in diameter, the upper one being white and the lower black.

Karlskrona is approached from sea by three entrances; the western lies between Arpö and Almö on the north and Hasselö on the south; the southern entrance is between Aspö and Tiurkö, and the eastern is northward of Långören.

Western entrance.—This entrance is available for vessels of 15½ feet draft at mean water level and 2 feet less at low level, but is narrow and tortuous, and affords no good anchorage inside the outer shoals. Without good local knowledge the channel should not be taken without a pilot.

Landmarks.—Hasselö, with its scattered groups of trees, of which those on Tångalund, on the southwest part of the island, can be seen from 8 to 10 miles off, forms a good landmark. On a nearer approach the beacon on Stångskär is seen, and Karlskrona Church, a large high building with two towers, and northwestward of it the large sheers in the dockyard, form good marks.

Hasselö pilot lookout, a mast with basket on top, stands on the northwestern side of that island.

Beacons in western entrance.—Stångskär Beacon on a low rocky islet, nearly a mile westward of Hasselö, is a cairn 13 feet high, white with red band, and surmounted by a pole, with double red and white cross.

Skräffinge Beacon, on a small low rock northwestward of Hasselö, is a pole 20 feet high, with a triangular board on top.

Almö Beacon, on the south point of Almö, north of Hasselö, is about 9 feet high, and white with red band. Just opposite to the southward are the fortifications on Hästhölm.

Dangers—Buoys.—Hyperions Grund, on which the depth is 2 fathoms, lies nearly 1½ miles 270° from Stångskär Beacon and ½ mile 126° from the southern end of Lindö, and is marked on its southern side by a red spar buoy with ball under an upturned broom.

Kräkans (Lilla Kräkan), a small rock on a shoal, lying about ¼ mile northeastward of Hyperions Grund, is marked at its south end by a red spar buoy, surmounted by an upturned broom.

From 700 to 1,200 yards 143° to 163° from Kräkans lies several shoal spots with a least depth of 3½ fathoms.

Kråk Reef, with several rocks above water, lies about 1,200 yards eastward of Kräkans, and is marked on the south side by four red spar buoys, with upturned brooms, the western of which has a ball under the broom.

Stångskär Reef, on the south side of the channel opposite Kråk Reef, is marked on the northwestern end by a black spar buoy with ball, and on the northeastern and eastern sides by broom buoys.

Sättekullen Shoal, situated 1.4 miles 190° from Stångskär Beacon, and about 700 yards westward of Hasselö Flöt, has a depth of 3

fathoms, and is marked on its western side by a red spar buoy, surmounted by a ball over an upturned broom.

Prohibited anchorage.—Anchorage, except in case of necessity, is prohibited within the area contained within a line drawn from the northeastern point of Hasselö to Almö Beacon, thence to southern point of Osterholm, thence to south point of Arpö Kalf, and thence to the center point of the northeastern side of Hasselö. Vessels wishing to anchor within this area for working cargo may obtain permission by application to the commandant of Västra Hästholm Fort, when an anchorage will be allotted. Three boards giving notice of this prohibition are placed on the north point of Västra Hästholm Fort, on a rock 600 yards eastward of the same fort, and on the northern Kasaskar, respectively.

Submarine mining practice is carried out during the summer in the western entrance, outside Västra Hästholm. Mines which might be an obstruction to navigation will only be laid during daylight, in which case the signal X P of the International Code, signifying "Beware of torpedoes, the fairway is mined," is hoisted under the signal yard of the flagstaff at Västra Hästholm Fort.

A guard boat, carrying a blue and white checkered flag, meets incoming and outgoing vessels, which are cautioned to closely observe all directions given by the guard boat, and to pass southward of the red flag buoys which are placed in the fairway.

Boats which while at anchor are engaged in mining operations show a red flag on the side on which approaching vessels can pass.

Torpedo practice.—Two range marks, about 130 feet in length, will be placed periodically on the torpedo range between Kottaskar and the Almö Beacon, one at 3,300 yards and the other at 6,600 yards from Kottaskar; a light will be shown at each end of the marks at night.

Pilots.—The Arpö pilots attend on Hasselö by day, and meet vessels from sea outside the outer shoals of the western entrance and also in the channel opposite the pilot station.

Directions.—In order to pick up a pilot for the western entrance to Karlskrona, stand in with Skräflinge Pole Beacon in line with Almö Beacon, bearing 68° (Karlskrona Church is seen northward of the pole beacon), which mark leads to about the middle of Hyperions Grund; pass southward of this shoal and of Kräkans (Lilla Kräkan), having passed which, wait for a pilot.

Karlskrona Harbor—Great Channel, also called Stora Leden or Kungsdjup, lies between Aspö and Tiurkö; the approach to this entrance is divided into three channels by the outlying rocks and shoals. The main channel is available for deep-draft vessels, the western for those drawing 23 feet, and the eastern for 21 feet.

Harbor regulations.—For ordinary regulations, see Karlshamn, and the pamphlet of regulations published by the harbor authorities.

Vessels arriving must not anchor so as to obstruct the dredged channel to the pier.

Vessels mooring alongside must have an anchor down at a sufficient distance to haul off if necessary.

Should vessels leave without paying proper dues, double dues will be charged besides other penalties.

After loading or discharging the piers must be cleaned.

Beacons and landmarks.—On Södra Bollö is a white pole beacon, with triangular board, apex downward, as topmark.

Aspösten, a small, low rock, on the western side of the entrance, about midway between Flag Grund and Aspöskär, southward of Aspö, is marked by a black pole beacon surmounted by a black triangle, apex upward.

Turkösten (Tjurkösten), a small, low, dark rock, on the eastern side of the entrance, is marked by a red pole beacon, surmounted by a triangular topmark, apex downward, under an upturned broom.

Aspö pilot lookout, westward from Drottningsskär Castle, is 59 feet high and red, with a white triangular board on top.

Flackeken, on Aspö, northward of Drottningsskär Castle, is an oak tree, on which is a high black pole, with square black board on top.

The fortifications on Aspö, Kungsholm, and Tiurkö (Tjurkö), also Storkö (Sturkö) Church, on the southeastern part of that island, are good marks.

Storm-signal station.—A storm-signal station is located on Aspö.

Dangers—Buoyage—Western side.—Flag Grund, with $2\frac{1}{2}$ fathoms water, the outermost shoal on the western side of the western channel, lies 1 mile 190° from Aspöskär, southward of Aspö. A black spar buoy, with ball, is moored near the eastern edge of this shoal. About 500 yards northeastward of Flag Grund is an unmarked shoal of $2\frac{3}{4}$ fathoms.

Saltknölen, a shoal with 9 feet water over it, lies on the western side of the main channel, with its center 1,500 yards eastward from Aspösten Beacon; it is marked on the southeastern side by a black spar buoy, surmounted by two balls, and on the western side by a red broom buoy.

Ellebåden, a reef with a low rock on it, situated about $\frac{1}{2}$ mile north-northeastward of Saltknölen, is marked at its southern side by a red spar buoy, with upturned broom; at its northern side by a red spar buoy surmounted by a down-turned broom over a ball; and on the northeastern side by a black spar buoy with three balls. Abreast Ellebåden and nearly in the center of the channel is a $4\frac{1}{2}$ -fathom patch.

Between Ellebåden and Aspöskär is a shoal of 3 fathoms, and north-westward of Ellebåden a black spar buoy with ball marks, the shoal ground extending southeastward from Aspö.

Dynan Grund, off the eastern side of Aspö, is marked by a black spar buoy with ball, and the end of the western obstruction in the narrows by a black buoy with cage and two black balls.

East side.—Esten, a rocky shoal awash, lies on the eastern side of the fairway, and is marked by a red spar buoy, with three down-turned brooms moored southwestward of it.

A red bell buoy, surmounted by a black and red ball, is moored a good $\frac{1}{2}$ mile south-southwestward of Esten Shoal.

Light buoy.—A red light buoy, exhibiting a flashing white light every 5 seconds, is moored 1,500 yards south-southwestward from Esten and close southeastward of the bell buoy.

Sundsbåde Flaket, a rocky shoal on which the depth is 4 feet, lies $\frac{1}{2}$ mile 8° from Esten and is marked on its eastern side by a black spar buoy, with a ball.

Sundsbådan, a rock awash on the northwestern end of Sundsbåde Flaket, is marked by a red spar buoy with down-turned broom over two balls on its western edge.

Bredbåden, awash, lies northeastward of Sundsbåde Flaket, and forms the continuation southward of Yttre Hjortgrund.

Yttre Hjortgrund, with rocks awash, is marked on the western side by a red spar buoy, with two down-turned brooms over a ball.

Inre Hjortgrund, with 3 feet over it, is marked by a red spar buoy, with down-turned broom over a ball, and a red buoy with cage and ball over a down-turned broom marks the outer end of the eastern obstruction in the narrows. This buoy will be replaced when necessary, on account of ice, by a red mark with a ball over a down-turned broom.

Between Sundsbåde Flaket and Turkösten (Tjurkösten) lie patches of 17 and 18 feet; southward of Turkösten (Tjurkösten) is a patch of $2\frac{3}{4}$ fathoms, and southeastward of Turkösten a patch of $1\frac{1}{4}$ fathoms named Rågrund.

Lights.—On Godnatt Rock, in Karlskrona Outer Road, a group flashing white light, with occulting white and flashing red sectors, is exhibited from a small gray tower on the fort, at an elevation of 58 feet above the sea.

The light is visible 13 miles. When the anchorage inside Kungsholm is obstructed by ice Godnatt Light is not shown. (For details and sectors see Light List.)

Two occasional fishing lights are shown at Rönneskär, southward of Hasselö; the northern light is fixed red, southern light fixed green, at elevations of 25 and 19 feet respectively.

Fog.—Easterly winds bring fogs at Karlskrona, which are thick in the offing.

Submarine mining practice.—Submarine mining practice is carried out during summer in the Great (Southern) and Eastern Channels leading to Karlskrona.

The undermentioned directions have been published for the guidance of vessels wishing to enter the harbor.

Great Channel.—During the progress of mining exercises in the Great Channel, a passage is kept free for traffic either eastward or westward of the leading mark. The former is indicated by a ball hoisted at the masthead of Drottning-skär Flagstaff, when vessels should keep close to the red buoy in the narrows abreast of Drottning-skär; the latter by a ball hoisted at half-mast on the the same flagstaff, when vessels should keep close to the black buoy off the obstruction extending from Drottning-skär Citadel.

By night, vessels can enter as usual by keeping in the sector of occulting white light shown from Godnatt Lighthouse.

Vessels must comply with all directions given from the guard boat, which carries a blue and white checkered flag, and hails approaching vessels.

Vessels or boats employed in mining operations, when at anchor, show a red flag on the side on which vessels can pass.

When mining exercises are being carried out in the Eastern Channel a guard boat, also carrying a blue and white checkered flag, is stationed there to warn vessels.

NOTE.—The guard boat will hail vessels by firing a blank charge and by waving the blue and white checkered flag.

Foreign men-of-war are not allowed to enter Karlskrona Harbor without special permission.

The limits are described in Chapter I.

Pilots.—Aspö is a pilot station; the pilots attend there and at Kungshall, eastward of the town (for outgoing vessels), and meet vessels outside Aspösten or Turkösten (Tjurkösten).

Directions for southern entrance.—When approaching the southern entrance to Karlskrona, Kungsholm Fort, open southward of Aspöskär, leads southeastward of the shoals off Hasselö, but not of those off Bollö; and Aspösten Beacon, kept close northward of Tångalund, leads southward of Hermanskulle, Rågrund Outer Shoal, and Esten Shoal.

Western Channel.—When 4 miles southwestward from Kungsholm Fort, bring Karlskrona Church Tower touching the western side of Drottning-skär Castle Keep, bearing 14° , which mark leads eastward of Flag Grund and Aspösten, also of an unmarked shoal of 3 fathoms, and westward of Saltknölen and Ellebåden Shoals. When

Ellebåden is abeam, steer 45° for the northwestern corner of Kungsholm Fort, and when the leading mark for the main channel comes on follow the directions given below.

Great Channel or Kungsdjup.—By day, when about 4 miles south-southwestward from Kungsholm Fort, steer toward it on a 22° bearing, and when the white gable on the eastern powder magazine on Mölholmen is seen between Kungshall Storehouse and Godnatt, bearing 15° , steer for the gable, keeping it between the objects mentioned. This course leads eastward of the black buoys on Saltknölen, Ellebåden, and Dynan Shoals, westward of the red buoys on Esten, Sundsbåden, Yttre, and Inre Hjortgrund, and through the gap between the obstructions extending from Aspö and Kungsholm.

If, on account of bad weather, pilots are unable to meet vessels outside the shoals, they can always get on board between the fortifications to pilot vessels to the road and harbor, and also to the anchorages off Aspö and Tiurkö (Tjurkö).

To reach the anchorage 600 yards from Hornudde, the northeastern point of Aspö, steer 11° , after passing the fortifications, passing eastward of Stora Jerskullen, a shoal with 5 feet on it, and marked on the eastern side by a black spar buoy with ball, after passing which steer northwestward, leaving to port a black and white spar buoy on the shoal ground northeastward of Aspö, and anchor in $7\frac{1}{2}$ fathoms, clay.

To reach the anchorage off Tiurkö (Tjurkö), steer northeastward after passing the forts, and when $\frac{1}{4}$ mile northward of Hägnäs Point on Tiurkö, anchor in $12\frac{1}{2}$ fathoms, clay.

At night, when approaching the entrance to the Great Channel, it should be remembered that the white light of Utklippan changes to red 3 miles outside the shoals south of Hasselö and $4\frac{3}{4}$ miles outside Esten; also that Utlängan group flashing white light is obscured more than $\frac{1}{2}$ mile outside Esten, but not over Flag Grund and the shoals off Bollö and Hasselö; the line of obscuration passes northward of the bell buoy outside Esten.

Before Utlängan Light bears 105° , bring Godnatt Light, occulting white, in sight between the bearings of 14° and 17° , and steer for it, keeping carefully within this sector, which leads between the dangers before mentioned and through the passage between the obstructions off the forts.

On the eastern edge of the occulting sector and about 1 mile outside the forts is a shoal of $4\frac{1}{2}$ fathoms. If the light changes to flashing white, the vessel is to the eastward, and if it changes to flashing red, she is to the westward of the channel.

When the fortifications are passed, continue for about a mile on the same course, when turn to port or starboard for either of the anchorages previously mentioned off Aspö or Tiurkö (Tjurkö).

Eastern Channel.—By day, when $3\frac{1}{2}$ miles south-southeastward of Kungsholm Fort, bring Flackeken on Aspö over the southern half of the roof of the keep of Drottningsskär Castle, bearing 336° , which leads between the shoals, having Turkösten (Tjurkösten) and Bredbåden on the starboard and Esten and Sundsbådeflaket on the port hand. When the leading mark for the Great Channel comes on, follow the directions previously given for that channel.

The above mark for the eastern channel leads close to the edge of some shoal ground, on which the depth is 17 feet, consequently, a vessel of greater draft should employ a pilot for the channel.

Roadstead.—Karlskrona has an extensive roadstead, with several good anchorages for a great number of large vessels. Immediately within Kungsholm there is a depth of nearly 15 fathoms, and farther in, north of Stora Jerskullen Shoal, about 9 fathoms.

The outer road, outside Getskär, has from $4\frac{1}{2}$ to $11\frac{1}{2}$ fathoms, and the inner road, inside Getskär, from $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms. Kofferdireden, or merchant vessels' anchorage, northeastward of the town, has a depth of about 11 fathoms.

All these anchorages are sheltered from every sea and have good holding ground of mud and clay. The principal approach from the outer to the inner road lies eastward of Getskär, but there is a buoyed channel westward of that rock, between it and the naval yard, available for vessels of 16 feet draft at mean water level. In the channel to Kofferdihamn, on the northeastern side of the town, the depth is 20 feet at mean level.

The numerous small shoals in the road are marked.

Anchorage.—There is anchorage for deep-draft vessels with Godnatt Tower bearing 272° , powder magazine 1° , and Flackeken Tree Beacon on Aspö 230° ; the bottom muddy.

Prohibited anchorage.—Anchorage is prohibited between the obstructions from Kungsholm to Aspö and a line from Flackeken on Aspö in an 80° direction to Tiurkö (Tjurkö). Vessels wishing to anchor within the above limits for the purpose of loading or unloading must apply to the commandant of the fort on Kungsholm, who will show them the position in which to anchor. Three notice boards, with notices about the prohibited anchorage, have been erected in the following positions: On the stone jetty outside Kungsholm Fort, southward of the obstruction, and about 110 yards from the shore end of the jetty; on Dröttingskär, on the northeastern mound, about midway between the cross near Vallhörnet and the northern gun; and on the eastern shore of Aspö, near Flackeken, previously mentioned.

Quarantine anchorage.—The quarantine and observation anchorage for Karlskrona is situated north of Hasselö, the boundaries being Almö, Löfgrundet, and Hasselö.

Anchorage and jetties for cargo within the fortifications.—Aspö Mad, north of Aspö, with anchorage in 4 fathoms, clay; dressed stone is shipped.

At Tiurkö (Tjurkö) stoneworks, on the northwestern side of the island, is a loading jetty 154 feet long, with from 12½ to 13½ feet alongside.

Nattraby, at the mouth of the river of the same name, northward of Karlskrona, has anchorage in 14 feet, mud over clay; at Ringhålla, outside the entrance to the river, there is a small jetty, with 5 feet water alongside. Wood and dressed stone are shipped and coal and manure landed.

Light.—A light is exhibited from a dolphin at the entrance to the Nattraby River.

Djupa Sund, between Tiurkö and Storkö, has anchorage in 15 feet. At Tiurkölandet and Sturkölandet there is a small jetty, with 14 feet water. Dressed stone is shipped. At Breavik (Bredavik), northern side of Storkö, there is anchorage in from 16 to 19 feet; stone is shipped.

Water level.—The usual difference between mean and low water levels is 2 feet. The greatest difference in the water level during the last 10 years has varied between 3 feet below and 2¾ feet above the mean level.

Ice obstruction occurs both in the road and harbor in February and half of March, but navigation is generally open throughout the year.

Harbor Lights.—Kungsholm.—A fixed white light, elevated 13 feet above the sea, is shown from Kungsholm Quay, near the eastern side of the boat harbor. (For sector see Light List.)

Godnatt.—On the northern side of Godnatt Lighthouse there is exhibited a fixed harbor light, with white, red, and green sectors (see Light List). The white light leads between the shoals south-eastward and eastward of Getskär. This harbor light is exhibited from August 1 to May 15.

Karlskrona.—On the Skeppsbron Pier, fixed red and green leading lights are exhibited. These lights in line lead through the deepest channel from the merchant vessels' road to the great steamboat pier and are exhibited between August 1 and May 31.

Dragso.—On Dragso, at the narrowest part of Prastsund, a flashing white light is exhibited, 19 feet above the sea, from a conical iron structure. The light is shown from September 1 to March 31 of each year. (For details see Light List.)

Laboratorie Holm.—About 1.2 miles 12° from Godnatt Lighthouse at Laboratorie Holm, from a circular white house is exhibited, at an elevation of 10 feet, an occulting white light with red and green sectors. The white light is visible 6 miles, red light 4 miles, and

green light 3 miles. (For details see Light List.) The southern white sector leads between the shoals eastward and northeastward of Getskär; it also shows white to the northward over the merchant vessels' anchorage or Kofferdiredden. The light is unwatched.

Karlskrona, one of the principal seaports of Sweden, is strongly fortified and is the chief establishment of the Swedish Navy. The town contains 27,508 inhabitants and is connected by railway with the interior; it has a seaman's hospital, shipbuilding yards, and several factories, foundries, and mechanical works.

Communication.—There is communication by steamer with Stockholm, the southern and western Swedish ports, Norway, Copenhagen, and Lübeck; by railway with the interior; and electric telegraph to all parts.

Radio Station.—There is a radio station at Karlskrona; call letters G. S. K. It is open to the public from 8 a. m. to 8 p. m.

Coal can be obtained at a moderate price; about 40,000 tons are imported annually, and about 1,800 tons are kept in stock. Coaling is performed by lighters, of which there are five of 50 tons; vessels of 17 feet draft can coal alongside a wharf.

Trade.—The chief exports are wood, granite, fish, scrap iron, and paper; the chief imports consist of bran, brandy and wine, coal and coke, coffee, grain, hides, machinery, manure, oil, petroleum, salt, and tobacco.

Dockyard—Docks.—There is a Government dockyard at Karlskrona where extensive repairs can be executed; it contains seven docks and a torpedo-boat slip. *See* Appendix I. The depth alongside the dockyard coal wharf is 18 feet.

Quays and jetties.—In the Kofferdihamn are two loading jetties, 197 and 236 feet in length, respectively, with a depth of 17 feet alongside; also a quay 1,025 yards long, furnished with railway lines, and with a depth of from 13 to 18 feet alongside at mean water level. At Kingsbron (the King's quay) on the southeastern side of the town, the depth is 9½ feet, and at Kungshall Jetty 11½ feet.

It is stated that vessels drawing from 19 to 20 feet can discharge at the quays.

Repairs.—Merchant vessels can be taken into the government docks when the latter are available. Besides the dockyard there is a small shipyard and machinery shop for small repairs.

There is a 6½-ton crane, locality not stated. Divers are available.

Supplies.—Provisions and ships' stores can be had in abundance. Water is supplied from the town mains through pipes on the quays; price about 28 cents per ton.

Tugs are available.

Time signal.—The time signal is made with a brown ball $3\frac{1}{4}$ feet in diameter, hoisted at a flagstaff on the eastern gable of a store in the dockyard; it is 81 feet above the sea, 74 feet above ground, and has a fall of 10 feet.

The ball is hoisted half way up at 5 minutes before signal, and close up at 2 minutes before; and is dropped by wire from Stockholm Observatory at noon Greenwich Mean time, corresponding to 1h. 2m. 22.4s. Karlskrona Mean Time, or to 1h. 0m. 0s. Standard (mid-European) Time.

The signal is made on Fridays only; should Friday be a holiday the signal is given on Thursday.

Should the signal be inaccurate the ball is again slowly hoisted and dropped to half mast; it is then hoisted close up and dropped at 0h. 5m. 0s. Greenwich Mean Time.

Chronometer comparisons may be made on other days on giving notice at the dockyard.

Position.—Latitude $56^{\circ} 9' 28''$ north, longitude $15^{\circ} 35' 36''$ east.

Deviation.—Determination of deviation can be carried out after request at the dockyard.

Telegraph.—From the eastern side of Kingsholm, eastward of the town to the western side of Basareholm, about 250 yards farther eastward, there are two telegraph cables, the shore ends of which are marked by poles, about 20 feet high, and surmounted by a red cross, with the words "Telegraf Kabel" in black letters on a white board underneath. Vessels are prohibited from anchoring in the vicinity of these cables.

Karlskrona to Torhamn's Point.—Through the skerries between Storkö (Sturkö) and Torhamn's Point, two narrow channels lead to the anchorage in Källafjärd southward of Hästholm, and to that between Inlängan and Ungskär.

Dangers.—Before the entrance to Källafjärd lie several shoals.

Hermanskulle—Buoy.—Hermanskulle, the western of these shoals, situated $1\frac{1}{2}$ miles southwestward from the south point of Sturkö, has $1\frac{1}{2}$ fathoms on it, and is marked on the southern side by a red spar buoy with up-turned broom over a ball.

Eastward from Hermanskulle are several unmarked shoals, among them being Flisa (Flisan), with 5 feet. Kammarbrinken, with 11 feet of water, southeastward of Hermanskulle, is marked by a black spar buoy with ball, moored off its southeast end.

Aspösten in line with Tångalund leads southward of these dangers.

Beacons—Eldsten.—On Eldsten, a small black rock, lying 1 mile southwestward of the south point of Inlängan, is a pole beacon, 42 feet high, with a white arm on top pointing eastward to the channel to Inlängan Anchorage.

Hästhholm.—On the southern part of Hästhholm, a bare and tolerably high island, stands a red iron pole beacon, about 39 feet high, with a triangular board, apex upwards, as topmark.

Ytter (Ytterö) Beacon, on the northeastern end of Hästhholm, is a pole beacon with square back board as topmark.

Koggaskär Beacon is a white cairn, 8 feet high, surmounted by a black pole with black triangle, apex downward, as topmark. It is situated on a small skerry, northeastward of Inlängan Anchorage.

Källafjärd, $1\frac{1}{2}$ miles southeastward of Sturkö, and southward of Hästhholm, is roomy and well sheltered from all winds, and has depths of 6 to 9 fathoms; farther in, in Hästhholm Anchorage, the depths are $3\frac{3}{4}$ to 6 fathoms; farther in, in Hästhholm Anchorage, the depths are of 23 feet draft at mean water level, with a smooth sea, or 2 feet less at low level. The entrance lies between Gåsholm, a rock westward of Eldsten, and from which shoal water extends 500 yards westward, and Kammarbrinken Shoal.

Flakaskär—Fishing Lights.—On the southwestern point of Flakaskär 2 fixed red fishing lights, 93 feet apart, in line when bearing 48° , are exhibited from September 1 to November 15 when fishing is being carried on. The eastern part of Flakaskär is named Ormskär.

Directions.—When 1 mile southwestward from Eldsten bring the Ytter (Ytterö) and Hästhholm Beacons in line bearing 22° , which leads between the shoals. When approaching Gåsholm, open the northern beacon a little westward of the southern to give a berth to the shoal water mentioned above, and when past Gåsholm bring the mark on again, which leads between shoals marked by three red spar buoys, with upturned brooms, to starboard, and four black and white spar buoys to port. The mark must be carefully preserved, and when between the third broom buoy and fourth black and white spar buoy, where the channel is little more than 200 yards wide, turn westward and anchor in Källafjärd Anchorage abreast of and 600 yards distant from the house on Ormskär. Or to proceed farther inward from the above buoys, follow the mark already mentioned, and when Ytter Beacon begins to disappear behind the houses on Hästhholm, continue toward those houses, past the fourth red spar buoy with broom, when haul a little eastward toward Hästhholm Anchorage, 400 yards southward of the point on which the southern beacon stands. From this anchorage vessels of 7 feet draft can reach Karlskrona by the inner channels, or the sea by Långören.

Inlängan Anchorage, southeastward of Inlängan Island, has a depth of $3\frac{3}{4}$ fathoms at mean water level, over mud and clay. A shoal of $2\frac{1}{2}$ fathoms lies on the leading mark, Långören Beacon in line with Koggaskär Beacon, and determines the draft of vessels

that can use the anchorage. The shoal is exposed to the sea, and the passage therefore requires smooth water. Both the anchorage and channel are narrow, and large vessels should not attempt to enter. From this anchorage vessels of 7 feet draft can reach Karlskrona by the inner channels, or the sea by Långören.

Neither of the above anchorages should be entered without a pilot unless locally acquainted.

A spar buoy has been established southeastward of Inulången Island in (approximately) latitude $56^{\circ} 03' 04''$ N., longitude $15^{\circ} 52' 00''$ E.

Pilots from Långören attend at Inulången by day, and may be obtained outside that island.

Utklippan, situated about 9 miles south-southeastward of Tjurkö, consists of two large and several small rocks; on the southern large rock there is a stone fortification with two towers.

Shoals—Buoys.—Northward and eastward of these rocks there are several outlying shoals; the southeasternmost, named Rosenklints Grunden, with $1\frac{1}{2}$ fathoms least water, lies $1\frac{3}{4}$ miles 96° from the lighthouse and is marked on its east side by a black and white spar buoy with three balls.

About $1\frac{1}{2}$ miles 43° from the lighthouse lies Holmebåd with 6 feet, on the northeastern edge of which is moored a black spar buoy with two balls; 1 mile westward of this shoal lies Westra Kullen (Västra Kulle), with $3\frac{1}{4}$ fathoms, and depths of 9 to 18 fathoms around; and Norra Kullen (Kulle), with $4\frac{3}{4}$ fathoms, lies 1,400 yards west-southwestward of Holmebåd Shoal.

Utnylingen, the northernmost shoal, with $3\frac{3}{4}$ fathoms, lies 2.3 miles 3° from the lighthouse, with a patch of $5\frac{1}{2}$ fathoms nearly $\frac{1}{2}$ mile westward of it, and another of 4 fathoms $\frac{1}{2}$ mile southwestward of Utnylingen.

Clearing mark.—Torhamn Church open eastward of Utlången Island leads eastward of Rosenklints Grunden.

Light.—From a red iron structure on the white tower of a fortress on the southern large Utklippan, the total height being 101 feet, is exhibited, at an elevation of 100 feet above the sea, a fixed and flashing white light, with red sector. The light is visible 16 miles. (For details and sectors, *see* Light List) and chart.

Fog signal.—During thick and foggy weather a gun is fired.

Utlången, the southernmost of the numerous islands extending from the coast eastward of Karlskrona, is low and barren, but there are several buildings on the island, which can be easily recognized from seaward. On its southwestern side there is a white stone beacon, surmounted by a cross, which, however, is no longer kept in repair.

Shoals.—Two shoals, which have not been properly examined, and the depth of which is not stated, have been found lying about

1,200 yards from the shore on the eastern side of Utlängan, about $\frac{3}{4}$ mile east-northeastward, and $1\frac{1}{4}$ miles northeastward, respectively, of the lighthouse.

Dangers—Buoys.—Several reefs, on some of which the sea breaks heavily, extend about $\frac{1}{2}$ mile from the south side of Utlängan, the easternmost, named Klotet, and the westernmost Saltbåden; the latter is marked on its southern edge by a red spar buoy, surmounted by an upturned broom over a ball.

A red spar buoy, with a down-turned broom surmounted by a ball, is moored off the southwestern side of Utlängan.

A red bell buoy, surmounted by 2 upturned brooms, is moored on the southern side of Klotet Reef.

When necessary, on account of ice, the bell buoy will be replaced by a spar buoy with two upturned brooms.

Clearing mark.—Torhamn Church, well open eastward of Långören Beacon, leads eastward of Klotet Rock. When coming from the northward do not haul westward round Klotet Rock until Eldsten Beacon is open westward of Utlängan.

Light.—A group flashing white light, with red sector visible 10 miles, is exhibited, at an elevation of 26 feet above the sea, from an octagonal white lighthouse, 26 feet high, on the southern extremity of Utlängan. (For details, see Light List.)

Life-saving.—A lifeboat and rocket apparatus are stationed at Utlängan Lightstation.

Storm signals.—A storm signal station has been erected on the south point of Utlängan.

Karlskrona—The eastern entrance—Shoals.—A recent survey has revealed several shoal patches, the depths on which have not been properly examined, extending a mile from the shore, lying in the entrance to the Eastern or Yttero Channel, and one similar patch lying about 1,200 yards to the eastward of the northeastern point of Ungskär.

Ungskär, situated a short distance northward of Utlängan, is low, barren, and tolerably well built on. On the south point of the island there are two cairn beacons, 12 feet high; the eastern is surmounted by a triangle and the western by a white cross.

The anchorage named Ungskärs lies southward of the island and is sheltered on the eastern side by Stora Balian Shoal. Vessels drawing $10\frac{1}{2}$ feet can pass through the channel north of Stora Balian Shoal at mean water level, and those of $8\frac{1}{2}$ feet draft at low level.

To enter, steer 266° for the two Ungskär Beacons kept carefully in line, which leads north of Stora Balian (Baljan) and between the outer buoys; afterwards haul southwestward and anchor behind Stora Balian in 14 or 15 feet mud.

Långören—Beacon.—Långören is a barren but inhabited island a short distance northeast of Ungskär. On its northern point, which is 6 feet above the sea, stands a beacon 62 feet high, surmounted by a horizontal cask.

The eastern entrance to Karlskrona passes northward of Långören, between it and Torhamns Point, through Ytterö Sound and Skallö Sound; it is very narrow and tortuous, and, although buoyed, those without local knowledge should take a pilot at Långören. The channel may be used by vessels of 6½ feet draft.

Beacon.—On Hammarören, a skerry westward of Torhamns Point stands a white stone beacon, 8 feet high.

Pilots.—Långören is a pilot station, but pilots cannot be obtained at night; they also attend at Inlängen, and meet vessels outside the outer shoals and also immediately inside Långören.

At the pilot station is a jetty 87 feet long, with 5 feet of water alongside at mean water level.

Torhamns Point, or Torrums Point, the eastern point of the coast of Bleking, is bare at the outer end, but farther northward is thinly wooded, and rises gradually toward the interior.

Torhamn Church, about 1½ miles north-northwestward from the point just mentioned, has a high spire, which may be seen from a considerable distance seaward.

BORNHOLM AND CHRISTIANSÖ.

Bornholm.—This Danish island lies about 75 miles eastward of Denmark, and 20 miles southeastward of Sweden. Though possessed of no natural harbors, it affords shelter, either at anchor under its lee, or while standing off and on. It is in general high ground, and its most elevated point is Rytterknægten (Rotterknægten) Bierg, which, in the middle of the island, rises 532 feet above the sea. On the summit of this Bierg there is a monument 40 feet high, named Kongemindet. Hammer Point, the northern extremity of the island, is low, and Due Odde (South Point), the southern extremity of the island, is also a low, sandy point.

Foreign ships of war are permitted to navigate or anchor in Danish waters without previous notice, except in inner waters.

1. Foreign war vessels are permitted, with the exceptions mentioned in this article, to anchor for short visits, without previous notice, in the ports of the island of Bornholm.

A stay of more than 48 hours, or the visit of a squadron, must be notified previously through diplomatic channels.

2. The restrictions in article 1 do not apply to vessels on board which are embarked heads of States or their official representatives,

or members of a reigning family, nor to ships escorting such vessels, nor to vessels in distress.

Landmarks.—The following are the principal landmarks on the west side of the island:

Hammershus, a ruin, stands on the summit of a steep rock 243 feet high, near the shore, about a mile southward of the lighthouse on Stejlebjerg. The ruins consist of high walls and towers, the highest of the latter being square, with embrasures. A hotel stands near the ruins.

Ruth Church.—The most conspicuous object on the island is Ruth Church, 5 miles from its northern end, with a square granite tower and a small white square bell tower close southwestward of it; it stands on a hill 426 feet high, and may be seen from a distance of 32 miles in all directions, except when Rytterknægten Bierg intervenes.

Hasle Church, in the town of that name, has a black steeple.

St. Klemen's Church, with a short steeple, lies about $3\frac{1}{4}$ miles inland, eastward of Hasle, at a height of about 360 feet, and is best seen from the southwestward; northwestward of it a hill, 416 feet high, has a **trigonometrical station** on it.

Hasle Colliery chimney is high and stands in a wood about $1\frac{1}{2}$ miles southward of Hasle. Frydenlund Mill, close to the coast close northward of Rønne, is conspicuous.

St. Knuds Church, of granite, with a square tower, stands east-northeastward of Rønne and about 230 feet above the sea.

There are several mills and high chimneys in the vicinity of Rønne.

Along the southwestern coast are the following churches: Ny Lars has a short, white, round tower with pointed roof; Aakirkeby, a gray building $2\frac{1}{2}$ miles inland; St. Peder's Church, white with red roof; and St. Povl's Church, white, without tower.

On the western side of the island there are two small towns, Rønne and Hasle; and on its eastern side Nexö, Svaneke, Gudhjem, and Allinge.

Pilots attend when the signal is made, if not prevented by stress of weather. At Danish ports, vessels in tow of tugs are exempt from compulsory pilotage in certain cases.

Lifeboat and rocket stations.—There are lifeboat and rocket stations at Snogebæk and Rønne; and rocket stations at Allinge, Gudhjem, Svaneke, and Hasle.

Local magnetic disturbance.—Great caution must be used with regard to the alteration of compass errors, when in the vicinity of Bornholm. The abnormal values of the variation are most marked

off Hammer Point, where a change of 6° has been noted while passing the point.

Well-marked maxima exist 5 miles westward of Hammer Point, and also off Svaneke; minimum values are found along the northwestern coast in the neighborhood of Hasle.

Hammer Point, the northern extremity of Bornholm, is composed of sand, and when seen from a long distance east or west appears like a low island; this point is steep-to; great caution is therefore necessary at night, as the high land behind renders it very difficult to distinguish.

Hammeren is the northernmost rocky part of the island; it consists of a hill 276 feet high, named Stejlebjerg, steep to the southwest but sloping gradually to the northeast, and separated from the rest of the land by a valley.

On the western side of Hammer Point, northward of Stejlebjerg Lighthouse, there is a stopping place with easterly winds, but when the wind shifts to northeast it is no longer safe. Southwestward of the lighthouse, small vessels may find shelter in Senne Bight in 6 to 7 fathoms, abreast the ruined castle; and large vessels farther out, with Hammershus bearing 116° , and the northern end of the island 76° , in a depth of 15 fathoms, fine sand.

Lights—**Hammer Point Light**, at the extreme northern point of the island, is a group flashing white light, elevated 66 feet above the sea, visible 13 miles and shown from a white rectangular tower, 38 feet in height. (For details see Light List.)

A fog signal near this lighthouse gives explosive reports.

West coast—**Hammeren**.—On Stejlebjerg, about 1 mile south-southwestward of Hammer Point, stands a circular granite lighthouse, 68 feet high, from which, at an elevation of 298 feet above the sea, is exhibited an occulting white light, visible for 22 miles. (For details see Light List.)

Stejlebjerg is an International Code signal station; also a telegraph station, the latter making day signals only.

Caution.—Electric arc lights are used in the quarries in Senne Bight, southward of Hammeren, and on the north mole of the harbor, as a rule, from 6 a. m. to daylight and from dark to about 7 p. m., and occasionally at night. The height of the lights is from 39 to 164 feet, and they are visible 14 miles. Since it is possible in thick or foggy weather that some one or more of these lights may be sighted, mariners are cautioned with respect to them.

Ice signals.—On the northern side of Stejlebjerg Lighthouse, a surface 18 feet square is painted white; and, by means of square black tablets placed on this surface, signals are shown indicating,

when necessary, where the southern approach to the Sound is blocked by ice, as follows:

1. Black tablet in upper left-hand corner: Ice near Stevns.
2. Black tablet in lower left-hand corner: Ice between Gjedser and Darsør Ort.
3. Black tablet in upper right-hand corner: Ice in Langelands Belt.
4. Black tablet in lower right-hand corner: Ice near Falsterbo.

The signals relating to lightvessels and lightbuoys are given by balls shown from the mast with yard, situated near the lighthouse, and signify:

1. Two balls at east yardarm: Falsterbo Reef Lightvessel not on station.
2. One ball midway on east yardarm: Drogden Lightvessel not on station.
3. One ball midway on west yardarm: Gjedser Reef Lightvessel not on station.
4. Two balls at west yardarm: The light buoys have been withdrawn.

Night ice signals.—A secondary light is exhibited from an iron standard 9 feet high 73 yards north-northwestward from Stejlebjerg Lighthouse. The light is fixed, varying in color according to circumstances, as follows:

A green light indicates that Falsterbo Reef Lightvessel is not on station.

A red light indicates that Drogden Lightvessel is not on station.

A white light indicates that neither of the above lightvessels are at their stations.

The light is elevated 250 feet above the sea, and should be seen as follows: The green light 5 miles, the red 5 miles, and the white 9 miles. (For sector see Light List.)

Lloyd's Signals.—There is a Lloyd's Signal Station at Hammershus.

David Bank, of sand and gravel, with 6 fathoms least water, lies $5\frac{1}{4}$ miles 323° from Hammer Point Lighthouse. From the shoal spot the bank falls quickly eastward and westward to depths of 22 and 33 fathoms, while in a north and south direction it extends about 3 miles with depths under 20 fathoms. Stejlebjerg Lighthouse in line with St. Ols Church leads eastward of the bank. This bank is the usual fishing place of the Sandvig fishermen.

Coast.—From Hammeren to Hasle, $6\frac{1}{2}$ miles southward, the coast is clear of outlying dangers.

Sene Bight.—In Sene Bight there is a small harbor formed by moles, named Hammer Harbor; the depth in it is 15 feet. From the south end of the north mole a short arm extends eastward. The securing jetty is at the north mole. Two steam cranes of $2\frac{1}{2}$ tons and a fixed crane of 4 tons are on the quays. There is telephonic communication. Two mooring buoys lie about 200 yards outside the

entrance. When entering it is necessary to round the end of the arm above mentioned closely. Pilots can be obtained.

The water rises with easterly and falls with westerly winds. The change amounts to $2\frac{3}{4}$ feet.

Lights.—Two fixed red range lights are occasionally shown at Hanner Harbor from beacons (with triangles), which are in line when bearing 75° .

Vang.—At the fishing village of Vang, 2.3 miles southward of Stejlebjerg, there is a boat harbor with outer and inner basins, in which the depth is 10 feet. There are two cranes of $2\frac{1}{2}$ tons. Water and provisions can be had. Pilots are available.

Fishing light.—A fixed white light is shown at Vang when boats are at sea.

Kaasegrund, a patch of 8 fathoms, lies 4 miles 214° from Stejlebjerg Lighthouse, and $\frac{3}{4}$ mile offshore; there are 11 fathoms inside it.

Teglkaas, about $1\frac{1}{4}$ miles southward of Vang, has a boat harbor with outer and inner basins, in which the depth is 8 feet; it is inaccessible in on-shore gales. A northeasterly gale raises the water $3\frac{1}{4}$ feet, a southwesterly one lowers it 2 feet.

Helligpeder, $1\frac{1}{2}$ miles northward of Hasle, has a boat harbor, with two basins, in which the depths are 4 and 5 feet, respectively. About 82 feet northward of the southwest molehead is a drying rock, which is left to the northward when entering. The harbor is inaccessible in on-shore gales.

Fishing light.—A fixed white light is shown from the northwest mole when boats are at sea.

Hasle Harbor.—The harbor at Hasle consists of a large outer basin, through which a channel $14\frac{3}{4}$ feet deep has been dredged, leading to the center and inner harbors, the former of which has depths of 12 to $14\frac{3}{4}$ and the latter $14\frac{3}{4}$ feet. The outer harbor has depths of $5\frac{3}{4}$ to 12 feet, and in its south angle is a small boat harbor, in which the depth is 2 feet. The harbor is inclosed by stone moles, and affords shelter from on-shore winds, but with westerly gales the sea breaks over the north end of the west mole. There is a 2-ton crane.

Danger—Beacons.—About 330 yards west-northwestward from the entrance to Hasle Harbor is a rock with 12 feet of water over it; it is marked on its northwestern side by a red pole surmounted by an upturned broom, and at the southwest end by a white pole surmounted by a straw wisp. A mooring buoy lies eastward of the rock.

Lights.—A fixed red lantern light, 30 feet above the sea, and visible 6 miles, is exhibited from a pillar on the western molehead.

A red light is shown on the Havnepladsen when steamers are expected.

Pilots can be obtained at Hasle.

Directions.—When approaching Hasle from the northward, keep Stejlebjerg Lighthouse in sight clear of the high land northward of Hasle until Hasle Church is in line with the harbor entrance. Steer in on this mark, passing eastward of the mooring buoy, and when in the entrance turn close to the west mole, as the depths toward the middle of the harbor decrease to 11 and 6 feet.

From the southward, Hasle North Mill, over a herring-curing establishment southward of Hasle, leads westward of Hvide Point and Nykirke Reefs, and when northward of the latter do not approach the shore within 600 yards. A pilot should be taken for Hasle if not locally acquainted.

Hasle, a village with 1,300 inhabitants, situated about $6\frac{1}{4}$ miles southward of Hammeren and $4\frac{1}{2}$ miles northward of Rønne, has telegraphic and telephonic communication.

Repairs.—Vessels up to 100 tons can be taken on a slip; small repairs to machinery can be effected.

Life-saving.—A rocket apparatus is stationed at Hasle.

Tugs.—There are no tugs, but the vessels of a local steamship company can perform towing work.

Supplies.—Coal and provisions are procurable; water is laid on to the quay, where it may be obtained.

Dangers.—From Hasle toward Rønne, there are three rocky ledges, viz, Sorte Hat, to the southward of Leuka (Lövkä) Village; it is but short, and derives its name from a large rock named the Black Hat, lying on the reef. To the southward of this lies Nykirke Reef, extending about 800 yards from the shore, with a depth of 1 foot on its rocks.

About midway between Nykirke Reef and Hvide Point Reef is a shoal of $2\frac{3}{4}$ fathoms, over $\frac{1}{2}$ mile from the shore.

Hvide Point Reef, with 3 to 4 feet water, projects over $\frac{1}{2}$ mile from Hvide Point, a point about 1 mile northward of Rønne; near the outer end of the reef there is a spot of 6 feet, with shoal water under 5 fathoms for $\frac{1}{2}$ mile farther westward.

Buoy.—A white can buoy, surmounted with a white pole and down-turned broom, is moored in a depth of 5 fathoms near the extremity of this reef.

Casgaard Reef, with 2 fathoms least water, lies about 1,600 yards southwestward from Hvide Point.

Clearing marks.—Hasle North Mill over a herring-curing establishment on the south shore of Hasle leads westward of Nykirke and Hvide Point Reefs. Rønne Castle, in line with the lighthouse on Rønne west molehead, leads southwestward of Hvide Point and Casgaard Reefs. On this mark, when Ruth Church is open eastward of Hasle bearing 31° , a vessel will be abreast the end of the reef, in a depth of 8 or 9 fathoms. Along the western side of Bornholm,

northward of Rönne, good anchorage may be obtained with easterly gales.

Norre Kaas, $\frac{1}{4}$ mile northward of Rönne, has a small boat harbor, comprising an outer harbor with from 5 to 7 feet and an inner harbor with about 6 feet of water. A narrow channel nearly 6 feet deep has been dredged along the east side of a mole extending in a northerly direction.

Light.—A fixed green light is exhibited at Norre Kaas when boats are at sea.

Rönne; reefs off—Buoys—Nordre Reef extends about 550 yards westward from the shore at Rönne to the 3-fathom line; it is rocky, with a patch of 2 fathoms near its western edge, and at the southwestern angle, about 300 yards from the mole head, a rock with $1\frac{1}{2}$ fathoms on it, marked on its western side by a white can buoy, surmounted by two down-turned brooms. A warping buoy lies close southward of the $1\frac{1}{2}$ -fathom rock.

Trindelen is a rocky shoal with a least depth of $1\frac{1}{2}$ fathoms, lying in the entrance to Rönne Road, between Nordre and Söndre Reefs; it is marked at its southwestern end by a white can buoy, surmounted by three down-turned brooms.

Söndre Reef extends nearly $\frac{1}{2}$ mile westward from Kastels Pynt, southward of Rönne; it is rocky and shoal with a least depth of $\frac{1}{2}$ fathom. A shoal spit projects $\frac{1}{4}$ mile northwestward from Kastels Pynt, and from its outer end a breakwater extends. The western side of Söndre Reef is marked by a red conical buoy, surmounted by two up-turned brooms.

Breakwater.—From the outer end of the shoal spit just mentioned, a detached, curved breakwater, 306 yards in length, extends in a west-northwest direction, with a lighthouse at its western end, which is about 400 yards distant from the harbor entrance.

Landmarks.—Rönne Church, with black steeple, stands on a knoll close to the harbor. Rönne Castle, about 800 yards southward of the church, is a round white building with red, pointed roof; both the above are good marks.

Lights.—From an octagonal gray and white tower, 60 feet in height, on the east side of Rönne Harbor, at an elevation of 78 feet above the sea, is exhibited a fixed red light.

From a white hexagonal tower near the end of the outer mole, at an elevation of 30 feet, a fixed red light is also shown. The above lights (356 yards apart) in line bearing 55° lead through the outer road up to the harbor entrance.

A fixed green light, 42 feet above the sea, and visible 2 miles in clear weather, is shown from a white post, 6 feet high, situated 525 yards 149° from the higher and principal of the above light towers; it is shown from August 1 to May 15.

A flashing white light with red and green sectors, elevated 30 feet above the sea, and visible 8 miles, is shown from a rectangular granite tower, 18 feet high, situated at the western end of the detached breakwater, southward of the harbor entrance. This light is shown from August 1 to May 15. These last two lights in line 86° lead southward of Trindelen.

(For details see Light List.)

Rönne Road lies between Nordre and Søndre Reefs, and eastward of Trindelen Reef. It has depths of from $3\frac{1}{4}$ to $5\frac{1}{2}$ fathoms, but is very narrow. There are four warping buoys on the eastern side of the road, besides one on the northern side, previously mentioned; the three inner ones serve to mark the edge of the shoal water. Westerly winds send in some sea, and in a westerly gale vessels should not anchor here on account of the ground swell.

Harbor.—Rönne Harbor is formed by stone moles, and is the largest in Bornholm; the depths in the outer part are from $2\frac{1}{2}$ to $3\frac{1}{4}$ fathoms, and in the inner part from 2 to $3\frac{1}{4}$ fathoms. The deepest water is on the southern side of the harbor. The width of the entrance between the mole heads is about 55 yards, and the depth $3\frac{1}{4}$ fathoms. The height of the quays is about $5\frac{1}{2}$ feet; on the quay is a 5-ton crane. The eastern quay and western mole have railway lines. The harbor offices and customhouse are close by. Alterations in the harbor are reported to be in progress.

Outside and southeastward of the harbor, near the inner end of the south mole, is a boat harbor with a depth of 1 fathom.

Water level.—During easterly winds the water rises 2.6 feet, and $5\frac{1}{4}$ feet in exceptional cases; it falls 3 feet with westerly winds.

Ice.—During the winter of 1911-12, Bornholm was ice-free with the exception of one day when ice appeared at Hammeren and a couple of days at Due Odde; but in the harbor of Rönne navigation was difficult for sailing vessels on 17 days during January, difficult on 1 day and impossible without a tug on 7 days in the beginning of February. In the winter 1912-13, Bornholm was free from ice, except in Rönne Harbor, where navigation was difficult for sailing vessels on 8 days, January 29 to February 5, 1913.

Pilots.—The pilots at Rönne act both as sea and harbor pilots. All merchant vessels have to pay inward and outward pilotage even when no pilot is employed.

Directions.—From the northward steer about south from off Hvide Odde Rev until past Casgaard Rev, and when nearing Nordre Rev keep outside the line of Ruth Church—Hasle Colliery Chimney, which mark also leads westward of the banks to the southward of Rönne.

There are two entrances to Rönne Road, the principal lying between Trindelen Shoal and the detached breakwater; to enter bring

the lighthouses in the town and on the western molehead in line bearing 55° , which leads some 50 yards from the western end of the breakwater and over a depth of $3\frac{3}{4}$ fathoms, northward of it; when the pole beacon with red square board as top mark, standing southward of the town, comes in line with the middle of a red house on the clip, steer toward it until the turn northward into the harbor can be made.

The northern entrance to the road is between Trindelen Shoal and Nordre Rev, and has depths of $3\frac{1}{2}$ to $4\frac{1}{4}$ fathoms, but the bottom is rocky and uneven. The leading mark through is a windmill over one-third of the roof of the arsenal, reckoned from the eastward. The mill is seen westward of Rönne Castle, and the arsenal is a building with a red roof eastward of the castle and seen over the trees.

At night, only the main entrance is used. Steer in with the red range lights in line 55° , until well past the detached breakwater and then round the west molehead into the harbor. The fixed green light southward of the town, in line with the fixed white light on the detached breakwater bearing 86° , leads southward of Trindelen Shoal.

Vessels approaching must show a white light at night; this signal is answered by a similar light on the outer molehead as a sign that the pilot is present to assist when entering.

Rönne is the capital of Bornholm, and has a thriving trade; shipbuilding is actively carried on, and small repairs to hull and machinery can be effected. Supplies for shipping are obtainable. There is a hospital here at which seamen are received. The population of the town amounted to 9,494 in 1911. From this place several vessels are dispatched to the Arctic Sea.

Coal can be obtained at Rönne; in 1909 about 2,000 tons were in stock. Vessels of 19 feet draft can coal alongside the warf in the outer harbor.

Trade.—The exports are chiefly granite and agricultural produce; the imports, coal and feeding stuffs. Eastward of the town are important kaolin works and stone quarries.

Communication.—There is daily communication by mail steamer, with Copenhagen. A railway runs to Aakirkeby and Nexö, and the town is connected by telephone with all of the villages in the island.

There is a telegraph station at Rönne, connected with the continent by submarine cable to Möen.

Repairs.—There is an iron and wood shipbuilding yard, also two large foundries with machinery shops, where small engines can be built and repaired, and two slips for vessels for 200 tons. Divers can be obtained.

Supplies.—Provisions and ship's stores can be procured. Water is supplied on the quay from waterworks.

Life-saving.—A lifeboat and a rocket apparatus are established at Rönne.

Quarantine.—The quarantine anchorage is in Arnager Bight.

Harbor signal.—When the approach to Rönne Harbor is not clear a ball is hoisted at the flagstaff, near the lighthouse, on the western molehead.

Time signal.—At Rönne a time signal (a clear-toned sound) is given daily at the telegraph office, at 1h. 0m. 0s. p. m. mid-European time, corresponding to noon Greenwich mean time.

Commanders of vessels can obtain the errors of their chronometers by attending at the telegraph office, access to which is allowed for the purpose.

Harbor regulations.—On arrival of the vessel a report must be made immediately to the harbor master, and the vessel moored in the position allotted.

Before going alongside the pier anchors must be hoisted inboard, yards topped and braced up, also all loose outside fittings so far as necessary must be taken inboard.

Vessels must not secure to the piers, but only to the mooring posts and rings. Iron cables, if used, must be puddinged and covered to prevent damage from chafing where they rest on the piles or piers, and all vessels lying at the piers must be provided with fenders to prevent damage to the pier.

Warps or cables obstructing the channel must not be used without the harbor master's permission, and if so used they must be slacked off to allow other vessels to pass.

Care must be taken so that the shore cables do not obstruct passage on the pier more than is necessary.

Working of the cargo must commence within 25 hours of going alongside, and must proceed without unnecessary interruption.

Vessels will be moved as the harbor authorities consider necessary, but vessels may not shift berth without permission.

For further information and details as to the regulations for fire and lights, loading and discharging ballast, and other special articles, use of material belonging to the harbor authorities, the harbor regulations, as published, should be consulted.

No admission is allowed to the piers, etc., except on business.

Southwest coast.—The southwestern coast of Bornholm consists generally of cliffs from 40 to 60 feet high, behind which the land rises gradually. From Kastels Pynt to Galgelökke Point, about $\frac{3}{4}$ mile southeastward, the coast is bordered by a reef and shoal water about 700 yards wide.

Hadde Reef extends southwestward about 800 yards from Galgelökke Point, and has a dry rock on it $\frac{1}{4}$ mile from the shore, and at the edge of the reef $1\frac{1}{2}$ fathoms.

Buoy.—The southwestern edge of Hadde Reef is marked by a red conical buoy, surmounted by one upturned broom.

Mölle Bight, between Hadde Reef and the 2-fathoms spit extending westward from Kors Point, has depths of $3\frac{3}{4}$ and 4 fathoms; shoal water extends 400 yards from the shore. Thence to Arnager, about $2\frac{1}{2}$ miles to the southeastward, a narrow, shoal, rocky bank fronts the shore.

Rönne Bank extends 18 miles from the coast between Rönne and Due Odde (South Cape), with general depths of 6 to 10 fathoms; the shoal spots of 6 fathoms lie 6 and $14\frac{1}{2}$ miles respectively about 77° from the Adler Grund Lightvessel; the eastern side of this bank is steep, deepening suddenly from 8 to 20 fathoms, but the western side slopes gradually. Strong winds from southwest to west cause a heavy sea on the bank, and vessels of deep draft should avoid the shoal spots. The Adler Grund, which lies southwestward of and is connected with Rönne Bank, is described later.

Dangers—Buoys.—On the inner part of Rönne Bank is a cluster of shoals, covered by $1\frac{1}{4}$ to $4\frac{1}{4}$ fathoms water, separated in places by a depth of from 7 to 8 fathoms; the group is about $3\frac{1}{2}$ miles in extent in a northwest and southeast direction, and extends about $2\frac{1}{2}$ miles from the coast between Rönne and Arnager.

A patch of $2\frac{1}{2}$ fathoms lies a short distance southwestward of the buoy marking Hadde Reef, with shoal water nearly $\frac{1}{2}$ mile westward and southward of it.

About $1\frac{1}{2}$ miles southwestward of Galgelökke Point is a depth of $3\frac{3}{4}$ fathoms, marked on the northern side by a white can buoy with three down-turned brooms, which forms the northwestern end of a narrow ridge extending $1\frac{1}{2}$ miles in a southeasterly direction. On this ridge are Mölle Bakke with $2\frac{3}{4}$ fathoms, Rönne Bakke with 3 fathoms, and Klinte Grund, at the southeastern end, with 3 fathoms.

A short distance southeastward of Klinte Grund is a shoal $1\frac{1}{2}$ miles long northwest and southeast within the 5-fathoms line, with a least depth of $4\frac{1}{4}$ fathoms on it.

Hvide Mæhrn, with $1\frac{3}{4}$ fathoms, lies nearly a mile southwestward of Kors Point, and has 6 fathoms close eastward of it; a spit, with a least depth of $3\frac{1}{2}$ fathoms, named Nydiep, extends nearly a mile southeastward. Hvide Mæhrn is marked on its northeastern side by a white can buoy, with two down-turned brooms.

Højbratter, with 2 fathoms, lies about 1 mile south-southeastward from Hvide Mæhrn, with which it is connected by a narrow ridge, and is marked on the northeastern side by a white can buoy, with one down-turned broom.

Akragrund, with $4\frac{1}{2}$ fathoms, lies nearly 3 miles southward of Arnager, and is over $\frac{1}{2}$ mile long northwest and southeast; westward of Akragrund are several patches of 5 fathoms.

Bakkegrund, with a depth of $2\frac{1}{2}$ fathoms, lies $4\frac{1}{2}$ miles 192° from Arnager, and is marked on its southern side by a white can buoy, surmounted by three down-turned brooms.

Bakkebrædt, with 3 fathoms, lies 700 yards west-southwestward of Bakkegrund and on the same bank.

The ground in the vicinity of these shoals is so uneven that other small unknown dangers may exist.

Directions.—Vessels of deep draft without local knowledge should pass southward of the buoy on Bakkegrund and outside all the shoals above mentioned. Ruth Church and Rønne Castle, in line 13° , take a vessel westward of Bakkegrund and Bakkebrædt, but lead straight for Mølle Bakke; the mark for passing westward of the latter and other shoals is given in the directions for Rønne.

Inside the reefs.—Under favorable circumstances vessels of deep draft can pass inside the reefs. After passing Due Point steer to pass southward of the buoy on Arnager Reef, to pass westward of which keep Rønne Castle just open westward of Kors Point; when Arnager Harbor is abeam steer for the white can buoy with two brooms on Hvide Mæhrn, leave it on the port hand, and steer to pass close north-eastward of the white can buoy with three brooms on the $3\frac{1}{2}$ -fathoms bank northwestward of Mølle Bakke.

Arnager Bight.—Off the point, at Arnager Village, 4 miles southeastward of Rønne, a very shallow reef, the inner part of which is partly above water, extends southeastward parallel to the shore for about $1\frac{1}{2}$ miles, with a channel through its inner part named Store Gab, in which the depth is 2 fathoms, marked on the southeastern side by a red pole with broom. Shoal water of $3\frac{1}{2}$ to 5 fathoms continues about $1\frac{1}{2}$ miles beyond the end of the reef, and is marked by a red conical buoy, surmounted by two upturned brooms, moored in 4 fathoms. A vessel will pass just to seaward of the reef when Kors Point, on which a stone beacon is shown, is in line with Rønne Church. A reef extends southward from Sose Point, northern side of entrance to Arnager Bight, off the end of which is Blak Shoal, with 5 feet water, close to the 5-fathoms line. Vessels may stand into Arnager Bight by passing between the above reef and Blak Shoal, passing outside the buoy marking the reef.

In the innermost part of the bay the depth is 15 feet, which gradually increases outward to 5 fathoms on a sandy bottom, but covered everywhere with large stones. With winds between southwest and southeast this anchorage is entirely open.

Arnager is a fishing village with a boat harbor, in which the depth is between 5 and 6 feet, inclosed by moles, with an entrance at the northeast corner. The moles are composed of pilework, with stone filling and granite upper works, and are connected with the shore by means of a bridge 200 yards long. Water and provisions can be procured.

Fishing lights.—A fixed white light, elevated 18 feet above the sea, is shown from the north mole of Arnager boat harbor, and a fixed red light, elevated 15 feet, is shown from the east mole. Both lights are shown from white posts, and are only exhibited when fishermen are at sea.

Quarantine anchorage.—Arnager Bight is used as a quarantine anchorage. Two mooring buoys for vessels in quarantine are laid out in about $3\frac{3}{4}$ fathoms of water, $\frac{1}{2}$ mile from the boat harbor.

Coast—Anchorage.—From Arnager Bight to Raghammer Point the bottom is very uneven inside the 5-fathom curve, with several rocky shoals. Thence to Due Odde (South Cape) the shore is clean except for a few rocks and narrow sandbanks extending from Gede-bak Point and Sommer Point. Accordingly, vessels may anchor with offshore winds in convenient depths. A good berth will be found in 9 to 11 fathoms, with St. Peder's and Aakirkeby Churches in line. Between Sose Point and Raghammer Point small vessels load china clay at several places on the open beach. At the fishing village of Boderne, about a mile westward of Raghammer Point, and at Pedersker Bakkerne, about 3 miles westward of Due Odde, moles have been built, behind which boats can lie.

Due Odde (South Cape).—Due Odde is surrounded by a sand-bank, 400 yards in width, but it can not be approached by the lead, being steep, the soundings decreasing suddenly, from 7 to 2 fathoms. The flat within the depth of 10 fathoms extends 1 mile off to the southward and $2\frac{1}{2}$ miles east-southeastward, when it falls abruptly into deep water; it affords a good stopping place during North and Northwest winds, with Aakirkeby Church nearly in line with St. Povl's Church, in a depth of 6 to 8 fathoms, clear sandy bottom: from this position sailing vessels can easily get under way if necessary. This anchorage is seldom used by small vessel on account of the swell.

Lights.—On Due Odde stand two lighthouses; the northern lighthouse, 1,717 yards within the south point of Bornholm, is a circular granite tower 128 feet high, from which is exhibited, at an elevation of 155 feet above the sea, a fixed and flashing white light visible 18 miles. (For details see Light List.)

The southern lighthouse, on the point, 1,147 yards 175° from the higher lighthouse, is an octagonal white tower, 49 feet high, from which is exhibited at an elevation of 51 feet above the sea, a white

fixed light, visible 12 miles. (For details of the above lights, see Light List.)

Fog signal.—During thick and foggy weather a siren, situated 103 yards southward of the front lighthouse is sounded.

Northeast and east coasts—Landmarks.—St. Ols Church, about 4 miles from the northern end of the island and $1\frac{1}{2}$ miles 240° from Tejn Village, stands about 360 feet above the sea, and is a white round church with black pointed roof; it is a good mark.

Lars Church, $2\frac{1}{4}$ miles southward from Gudhjem and about 328 feet high, has a low circular tower, white, with black pointed roof.

Kure Mill lies high, about $1\frac{1}{2}$ miles westward of Svaneke, and is conspicuous.

Svaneke Church is low, with black steeple, and stands in the middle of the town; two mills lie northwestward, and one mill southeastward of Svaneke.

There are few landmarks on the east coast, the principal being Aardsdale Mill southward of that place and another mill $\frac{1}{2}$ mile northward of Nexö; both are white and stand close to the shore.

St. Bodils Church stands 2 miles westward of Nexö, a little southward of the wooded hill, Slamrebjerg. It is white, with a small belfry southward of it, and is clearly seen from the southeast.

Sandvig.—In Sandvig Road, in a small bay named Aasand Bight, on the eastern side of Hammer Point, good anchorage, with off-shore winds, may be found in 5 or 6 fathoms; but if the wind veers round, a sailing vessel must get under way immediately, lest, by remaining too long, it might prove difficult to weather the point. At Sandvig there is a boat harbor with 6 to 7 feet water; a rock with 1 foot of water on it lies 55 yards eastward of the entrance. The harbor is inaccessible in on-shore gales. There are no pilots.

Light.—A fixed white fishing light is exhibited when the boats are at sea.

Allinge.—Off Allinge, anchorage may be obtained with winds from west-northwest to south-southwest, but the ground slopes steeply. In a depth of 7 fathoms, where the ground consists of sand, gravel, and a few rocks, a vessel will be sheltered from northwest to south; but the swell is annoying, and the common anchorage is farther out, with Allinge Church bearing about 240° .

Light.—A fixed red harbor light is shown from the north mole head in the navigable season when the harbor is not obstructed by ice.

Harbor.—There is an outer harbor, with 12 feet, and an inner harbor, with 11 feet of water, with a gate between them. At the outer harbor is a 5-ton crane, and at the inner harbor two cranes of 10 and 6 tons respectively. About 250 yards northeastward of the harbor entrance is a mooring buoy.

Pilots can be obtained.

Directions.—To enter, pass well outside the mooring buoy and then to the entrance; pass close southward of the north mole head and then turn northwestward into the harbor.

Supplies.—Coal and provisions can be procured. Water is obtained from the fountain in the town, near the harbor.

Wooden vessels can be repaired.

Communication.—There is steam communication with Copenhagen, Hasle, and places on the east coast of Bornholm.

Life-saving.—A rocket apparatus is stationed at Allinge.

Tein is a small village, where there is an outer harbor with 8 feet and an inner harbor with 7 feet of water, sheltered from all winds. Before the harbor are several rocks with from 3 to 6 feet of water on them. The course to the entrance is 158° , but local knowledge is necessary to enter. There is a slip for small craft up to 15 tons in each harbor. Easterly winds raise the water 2 feet, and westerly and southerly winds cause a fall of the same amount.

Motor boats are available for towing. A wreck, dangerous to navigation, with $1\frac{1}{2}$ fathoms over it, lies about $\frac{1}{4}$ mile eastward from the mouth of the harbor.

Range lights.—The rear light, at harbor office, is fixed white, with red and green sectors, elevated 30 feet; the outer light, on west mole, elevated 18 feet, is fixed white; they are 83 yards apart, and in line when bearing 158° . (Shown when fishing boats are at sea; see Light List.)

Provisions and water can be obtained.

Anchorage.—There is anchorage, with off-shore winds, on the bank northward of Tein, about 1,400 yards from the harbor, in from 6 to 7 fathoms.

Salene Bay.—There is anchorage with off-shore winds in the middle of Salene Bay in from 5 to 6 fathoms.

Norresand, on the eastern side of Salene Bay, has a harbor principally for fishing vessels. The depth in the entrance and in the harbor is 11 feet. A warping buoy lies 300 yards westward of the harbor. There is a slip for small craft.

Lights.—A fixed red light, elevated 27 feet, and a fixed white light, elevated 20 feet, are shown from August 1 to April 1; in line they lead between the piers.

Supplies.—Water and provisions can be obtained. Boats are built.

Gudhiem.—The large village Gudhiem is inhabited by fishermen; it stands on a projecting point eastward of Sorte Point, and has a harbor consisting of three basins, of which the outer has a depth of $10\frac{1}{2}$ feet, the center basin 10 feet, and the inner from 5 to $5\frac{3}{4}$ feet of water. The outer mole, of granite, is 8 feet high, with a parapet 13 feet above the sea. Rocks lie on both sides of the entrance, the

width of which is 46 feet, and against which is the securing place for steamers. The height of the harbor quays is 4 feet. A 10-ton crane is on the loading jetty in the center harbor, and besides there is a 1½-ton traveling crane. There is a slip for small craft.

Fishing lights.—Near the entrance to Gudhiem Harbor 2 fishing lights, fixed red, elevated 20 feet, and fixed white, elevated 26 feet, are exhibited, which in line 202° indicate the direction of the harbor. They are lighted from August 1 to May 1, when the harbor is accessible, and on dark nights during the rest of the year when fishermen are out.

Pilots.—Gudhiem is a pilot station.

Supplies.—Provisions can be procured; water is obtained from private wells near the harbor.

Communication.—There is telegraph and telephone communication, and steam communication similar to Tein.

Life-saving.—A rocket apparatus is stationed at Gudhiem.

Maelsted, about ½ mile southeastward of Gudhiem, has a boat harbor with a depth of about 6 feet. Some reefs lie outside the harbor, which can only be entered with local knowledge. Provisions and water are to be had.

Fishing lights.—Two fixed white lights, 17 and 9 feet above the sea respectively, are shown from poles, northwestward of the harbor at Maelsted when boats are at sea.

Anchorage may be obtained abreast the white beach at Maelsted with southwesterly winds, in from 7 to 9 fathoms, sand.

Bolshavn.—Off Bolshavn Village there is good anchorage in about 8 fathoms, with west and southwest winds, but northwest winds occasion a heavy swell.

Listad, about 1 mile southeastward of Bolshavn, and the same distance northwestward of Svaneke, has a safe harbor of refuge for small craft.

The harbor consists of four basins with depths of from 7 to 9 feet. Several rocks lie outside the harbor, and local knowledge is required to enter. The water rises 2½ feet, with winds from northwest through north and east to south, and falls the same amount with winds between southwest and northwest.

Fishing lights.—Two fixed range lights, with red and white sectors, elevated 20 and 14 feet respectively, are shown from poles 90 yards apart at the harbor of Listad, and in line 191°, lead into the harbor. (For sectors, see Light List.)

A fixed white light, elevated 14 feet, is shown from a pole on the west mole. All these lights are shown when boats are at sea.

Svaneke.—The northeastern end of Bornholm has three projecting points, the northern of which is named Möllenakke and the southern Sandkaas Point. The harbor of Svaneke lies in the small

bay northwestward of Sandkaas Point, and consists of an outer port used chiefly by boats, with a depth of 5 feet, besides an outer and an inner harbor, separated by a gate, in which the depths are 14 and 12 feet respectively. The entrance is 14 feet deep. The granite quays have a height of $6\frac{1}{2}$ feet in the outer and $4\frac{1}{2}$ feet in the inner harbor, with a depth of 12 feet alongside. There is a 5-ton crane.

Northward of the entrance a breakwater, about 115 feet long, extends southeastward. A warping buoy lies east-southeastward of the harbor. In the outer port there is a jetty, 55 feet long, for boats, with 7 feet alongside.

Lights.—Two fixed range lights, the rear red and the front white, in line 297° , are shown at Svaneke Harbor occasionally. A fixed white and green light is shown from the outer end of the breakwater.

Water level.—The variation in the water level is irregular; long continued westerly winds, followed by a change to east, cause a rise, and southerly and easterly winds a fall, amounting to 3 feet.

Directions.—Large vessels must avoid some rocks that lie on the southern side of the bay about 200 yards offshore. The line of range lights can first be used by large vessels after passing these rocks.

Communication.—Svaneke, with 1,300 inhabitants, has regular steam communication with Copenhagen, Hasle, and places on the east coast of Bornholm. There is a post boat to Christiansö.

Repairs.—Vessels of 150 tons can be hauled up. There is a wooden shipbuilding yard; carpenters and smiths can be obtained.

Supplies.—About 2,000 tons of coal are in store. Provisions can be procured, and water is obtained from private wells near the harbor.

Life-saving.—There is a rocket apparatus at Svaneke.

Coast.—From Svaneke the coast is clear as far as Nexö except for a shoal of $2\frac{1}{2}$ fathoms northward of Aarsdale.

Frenne Roadstead, $\frac{1}{2}$ mile northward of Aarsdale, has depths of from 5 to 7 fathoms 400 yards from the shore, northward of the shoal of $2\frac{1}{2}$ fathoms just mentioned. Small vessels can go nearer the shore, where the holding ground is better. On-shore winds, which are usually preceded by a swell, quickly raise a heavy sea.

Aarsdale, a fishing village in a small bay about $1\frac{3}{4}$ miles southward of Svaneke, has a boat harbor in which the depth is 8 feet. It consists of an outer and an inner harbor, and is sheltered from all winds. Outside the harbor lie some rocks, and the course in 237° , lies between them up to the outer mole head, behind which the narrow harbor entrance lies southeastward. The water rises with easterly and falls with westerly winds about 1 foot.

There is a slip for small craft up to 15 tons. Water and provisions can be obtained.

Lights.—Two fixed range lights are occasionally shown at Aarsdale from poles, the front red, elevated 13 feet, and the rear white, elevated 49 feet; in line 237° they lead into the harbor.

Anchorage.—Southward of Aarsdale there is good anchorage for small vessels in $4\frac{1}{2}$ to 6 fathoms, with Aarsdale Mill bearing 281° .

Off the east point of Bornholm, about midway between Aarsdale and Nexö, is a rock above water close to the shore, with deep water outside it.

Nexö Road is the most frequented anchorage off Bornholm; less swell is felt here than at Due Odde and better shelter; but it is more difficult to quit if the wind should suddenly come in from seaward. The nature of the bottom requires that the anchor should not be eased down, but be let fall at once, in order to break through the flags. The best berth is considered to be with St. Bodils Church open just southward of the harbor, in a depth of 7 or 8 fathoms; but the space is limited, as the depth suddenly increases farther out. Vessels are liable to drive if they anchor on such steeply sloping ground, and should give a good scope of cable.

Nexö Harbor consists of a large basin with a depth of 16 feet, a smaller with 12 feet, and a boat harbor with 8 feet. Before the entrance lies a breakwater about 400 yards long and 6 feet high, which shelters the harbor from the southeastward.

On the west side of the entrance lies the north mole, parallel to the breakwater for about 200 yards from the shore, and between them is the entrance, with a depth of 16 feet. Mooring posts are placed round the harbor basins and bollards on the breakwater. At the harbor entrance are gates to keep out the swell.

A mooring buoy lies about 100 yards northward of the northeast end of the breakwater.

There are three cranes—a steam crane of $2\frac{1}{2}$ tons, a floating and a traveling crane of $1\frac{1}{2}$ tons each. Railway lines are laid to the harbor.

Water level.—Winds between east and southwest cause low water, but it may rise with an easterly wind if strong westerly winds have prevailed a long time previously. With westerly to northerly, and especially with northeasterly winds, the water rises. The difference is seldom more than 2 feet.

On-shore gales cause an outgoing current inside the breakwater, which may attain a velocity of $1\frac{1}{2}$ knots.

Lights.—A fixed red light, elevated 24 feet above the sea, is exhibited from a white iron pillar, 19 feet high, situated on the outer extremity of the southern breakwater.

Two fixed green range lights are exhibited to lead into the harbor entrance between the breakwaters. The front light, elevated 20 feet

above the sea, is exhibited from a white iron pillar situated on the east mole near the entrance to the southern boat harbor. The rear light, elevated 30 feet above the sea, is exhibited from a white iron pillar situated in the square eastward of the railway at a distance of 115 yards 232° from the front light. These lights are exhibited throughout the year. (For sectors, see Light List.)

Fog signal.—On the outer end of the north mole a bell is rung when vessels are expected or boats are at sea.

Pilots can be obtained at Nexö.

Directions.—The leading mark in is a high tree in the southern part of Nexö, seen midway between the large breakwater and the north mole; the entrance will then be seen open.

At night the fixed green lights in line 232° lead in westward of the large breakwater.

Nexö, with 2,500 inhabitants, has regular steamer communication with Copenhagen and the places in Bornholm, except Rønne. There is telegraphic, also telephone, communication. The railway station is near the harbor.

Shipwrights can be obtained; there is an iron foundry and an engine factory.

Dock.—There is a dry dock at Nexö in the northeastern corner of the large basin; see Appendix I. There is a slip for vessels up to $7\frac{1}{2}$ feet draft.

Salthammer Reef.—About $1\frac{1}{2}$ miles southward of Nexö, Salthammer Reef extends a mile from shore in an easterly direction, with depths of from 1 to $2\frac{1}{2}$ fathoms, and a reef extends $\frac{1}{4}$ mile northeastward of Salthammer Point, a little to the southward.

Buoys.—A red spar buoy with staff and up-turned broom is moored in $4\frac{1}{2}$ fathoms on the south side of Salthammer Reef and a red conical buoy with two upturned brooms on its eastern side. The wreck of a steamer lies on Salthammer Reef, and is marked by a wreck buoy moored 200 yards eastward of it. In the bay northward of Salthammer Reef there are rocks, and the bottom is foul. Due Odde (South Point) open of Broens Point leads southeastward of Salthammer Reef.

Snogebæk is situated southward of Salthammer Point. There is a boat harbor at Snogebæk with depths of from 5 to 7 feet. It is a small, square basin, about 100 yards from the shore, with which it is connected by a bridge. The moles are 4 to 5 feet high, with a breastwork wall about 3 feet high. Northeasterly winds raise and southwesterly winds lower the water level about 1 foot.

Beacons.—At Snogebæk stand two beacons, to mark the direction of the telegraph cable to Libau.

Fishing lights are exhibited at Snogebæk, while boats from the harbor are at sea, from August 1 to May 1. These lights are fixed

white, 39 yards apart and are in line when bearing 318° . The lights in line lead close outside Broens Reef to the harbor.

Life-saving.—A lifeboat and rocket apparatus are stationed at Snogebæk.

Broens Reef extends about 400 yards eastward from Broens Point about $\frac{1}{2}$ mile southward of Salthammer Point. Shoal water under 5 fathoms extends over $\frac{1}{2}$ mile southeastward from the point.

In the bight between Broens Reef and Salthammer Reef, the bottom is clear sand, and the locality is therefore sometimes resorted to by coasters and other small vessels for temporary anchorage.

Christiansö (Ertholmene).—About 14 miles eastward of the northern extremity of Bornholm lies a small group of islets named Christiansö, formerly Ertholmene, consisting of Christiansö, Fredriksholm, Græsholm, and Tat, with several surrounding rocks; they are all generally termed Christiansö.

Only Christiansö and Fredriksholm are inhabited; together they formerly formed a fortress, the towers and walls of which may still be seen. Fishing is the principal occupation of the inhabitants.

Christiansö, the largest islet, is 72 feet high; Græsholm and Tat are 33 and 20 feet high respectively.

Landmarks.—The best landmark is the great tower on Christiansö; it is round, without roof, and about 82 feet wide, with a small light tower on its southeastern side.

Frederiksholm Tower, on the northern side of that islet, is round, with a pointed roof. Besides these, there are 10 beacons on the islets, which are described hereafter.

Shoals—Beacons.—Northwest Grund is a small bank with a depth of 15 fathoms at it, lying $1\frac{1}{4}$ miles northwestward of Tat, with that islet in line with Christiansö Church, a white building northward of the great tower.

The undermentioned shoals and islets lie on a bank about $1\frac{1}{2}$ miles in length northwest and southeast, and about 1,200 yards broad, within the 20-fathom line. On the southern and eastern sides the bottom falls steeply, less so on the western side, and northwestward and northward of Northwest Grund the depths quickly increase to 40 and 50 fathoms.

East Skær is a group of rocks lying 250 yards southeastward of Christiansö, and between them is a small skerry, Høgebur, surrounded by sunken rocks, which extend toward East Skær. The channel between Høgebur and Christiansö is narrow and of no importance.

Snark Rock, sunken, lying about 60 yards southward of Fredriksholm, is marked on its southern side by a pole with straw wisp as top mark, but as, owing to the steep bottom, this mark is frequently carried away, two beacons on the southern side of Christiansö in line

lead southward of the rock. The rear beacon has a horizontal and the front beacon an upright cask as top mark.

West Skær lies about 60 yards westward of Fredriksholm, with a narrow 2-fathom channel between. Shoal water extends more than 100 yards westward from West Skær.

Spro Rock lies a short distance northward of Fredriksholm, close to the 5-fathom line.

Kullen, a small rocky shoal of 2 fathoms, lies about 60 yards northward of Gyldenlöves Head, the northern point of Christiansö; between the shoal and the point is a 7-fathom channel called Kullerende.

Two beacons on Christiansö in line about 173° lead westward of the Kullen Shoal; the rear beacon stands in about the middle of the islet and has a square board as top mark; the front beacon, with circular disc as top mark, stands on the wall of a fort inside Gyldenlöves Head.

The two southeastern beacons on Græsholm in line about 264° lead southward of Kullen and through the Kullerende; of these beacons, the rear one has a square board and the front one a circular disc as top mark.

Skaaninge Reef extends about 250 yards northeastward from Græsholm; outside the outer end of the reef is a detached reef with 1 fathom least water.

The two northern beacons on Græsholm in line close southward of the detached reef; the rear and front beacons have a square and a triangular board, respectively, as top mark.

The two beacons on Fredriksholm in line lead close eastward of the detached reef just mentioned; the rear beacon, in about the middle of the islet, has a square board, and the front beacon, on the fortress wall at the northern end of the islet, has a circular disc as top mark.

Fleskehasen is a rocky ridge with from 2 to 5 feet of water on it, lying 65 yards eastward of Græsholm, in a north and south direction.

Jomfru Rock is a small rock on a reef southward of Fleskehasen, and extending about 100 yards from Græsholm.

Hase Rock, a small rocky shoal with 2 fathoms over it, lies 250 yards eastward of Græsholm. The two beacons on Fredriksholm previously mentioned lead eastward of Hase Rock. A rock with 4 fathoms on it lies a short distance eastward of Hase Rock and eastward of the line of beacons.

Tat Islet is surrounded by rocks and shoals which extend 350 yards westward, but less than 200 yards in other directions. Fleget, the shoal on the west side of the islet, has several spots of less than 6 feet water.

The round beacons are painted white and the square beacons black.

Lights.—A flashing white light is exhibited from the largest tower of Christiansö Fort, at an elevation of 95 feet above the sea, visible 15 miles. (For details see Light List.)

A fixed white light, with red and green sectors, elevated 23 feet above the sea, is exhibited from a brown wooden house, 11 feet high, situated on Fredriksholm, western side of Christiansö Harbor, at a distance of 375 feet 285° from Christiansö Lighthouse. The white, red, and green lights are visible 9, 6, and 5 miles respectively. (For sectors see Light List.)

Fog signals.—Two powerful sirens are located on Christiansö. One siren, situated close northward of the lighthouse, transmits sound strongest in a northwest direction; the other, situated about 230 yards southeastward of the lighthouse, transmits sound strongest in a southeast direction.

Channels.—There are three channels between the islets, viz: The harbor of Christiansö between that islet and Fredriksholm; Taarn Channel, the channel between Fredriksholm and Græsholm, with more than 7 fathoms, but abreast Jomfru Rock it is less than 100 yards wide between the 5-fathom curve; and West Channel, between Græsholm and Tat, about 350 yards wide between the shoals on either side, with depths of more than 10 fathoms in the middle.

Current.—A very considerable current may run between the islets, especially in stormy weather, its direction following that of the wind and current in the Baltic.

Harbor.—The narrow sound between Christiansö and Fredriksholm forms a safe harbor, and is of great consequence to the Baltic traders during severe icy weather, as vessels may find tolerable shelter, except from gales from the north. The harbor is divided by a floating bridge, which connects the two islands, into the north harbor, in which the depth is 4 fathoms, and the south harbor, with 3 fathoms, but in the entrance to the latter the depth is $2\frac{1}{2}$ fathoms. The plan shows more water in both harbors, and only 2 fathoms in the southern entrance. The floating bridge can be swung to the side to allow vessels drawing 16 feet to pass. Wharves are found only on the eastern side of the south harbor, where vessels of 12 feet draft can lie. Vessels in the north harbor generally secure to ring-bolts in the rocks.

Pilots.—Christiansö is a pilot station. A signal mast stands southeastward of the great tower, from which the signals of approaching vessels and those desiring a pilot are answered by hoisting the International Code pendant "Yes." If there is no room in the harbor, the pendant "No" is hoisted.

Pilotage is compulsory for the harbor for all vessels over 30 tons gross.

Repairs.—Little can be done in the way of repairs. Vessels can be hove down, and there is a slip for small craft of 20 tons.

Supplies.—Coal, water, and provisions can be obtained; also stone ballast. Communication takes place with Svaneke by post boat four times a week.

Life-saving.—Christiansö is a lifeboat and rocket station.

Directions for sailing vessels.—Should stress of weather prevent the pilot from proceeding out, the following directions for making Christiansö harbor may be of great importance:

With the winds from north to east-southeast the southern entrance is used; sailing vessels approaching from the eastward should pass southward of East Skær, then round the south end of Christiansö very closely, and head between that islet and Snark Rock, on which there is a beacon. Here the pilot will be in readiness; and if the wind be too northerly to fetch into the harbor, sail must be quickly furled, a hawser made fast ashore, and another carried out by the pilot vessel, to warp into the harbor. Assistance is always at hand if required.

If from the westward, pass close southward of Snark Rock, though the beacon is frequently carried away, and then act as above directed. During southerly or southeast gales the southern inlet can not be approached.

With winds between southeast and north, through south and west, the northern entrance is used. If from the eastward, with the wind between southeast and south, the best passage is through the Kullerende, between Kullen Shoal and Gyldenlöves Head, the northern extremity of Christiansö. The mark to lead through this passage is the round and square beacons on Græsholm in line. Kullen Rock is passed when the beacons near Gyldenlöves Head and in the middle of the islet are in line. The pilot will be in waiting there, with a hawser, if the wind be too scant to sail into the harbor; if not, hug the weather shore, and let go the port anchor when in the entrance.

With the winds from south to west, stand through the Taarne Channel between Fredriksholm and Græsholm, and when abreast Jomfru Rock on the Graesholm side, let go the port anchor and pay out cable until abreast Spro Rock off Fredriksholm, where the pilot will be ready with hawsers to transport the vessel into the harbor.

With winds from west to north, pass eastward of Tat Islet and Skaaninge Reef, and as soon as the two beacons at Christiansö are in line keep them so, or between that line and that of the Fredriksholm Beacons, which will lead eastward of the Skaaninge Reef and the

Hase Rock, on which there is a depth of only 2 fathoms. When abreast Hase Rock the beacons on Græsholm will be in line; thence approach the harbor, shortening sail in time, and let go the star-board anchor when in the harbor mouth, having a hawser in readiness to carry on shore.

From the narrowness of the harbor, as well as the channels leading into it, strangers should not enter without a pilot.

On applying to the governor hawsers and warping materials will be furnished on very moderate terms.

CHAPTER III.

KALMAR SOUND AND ÖLAND.

Kalmar Sound.—The coast from Torhamns Point trends in a north-northeasterly direction 88 miles to Kråkelund, and forms, with Öland (which is 74 miles long north-northeast and south-southwest, and 2 to 8½ miles across), Kalmar Sound, named after the town Kalmar, situated on its western shore. The sound is about 12 miles wide at the southern and northern entrances, but the middle and narrowest part abreast Skägganäs Peninsula is only 1.7 miles in width.

There is anchorage in the southern part of the sound, on sand and clay; the holding ground is good, and vessels with good ground tackle ride out heavy gales from south-southwest or southwest anywhere southward of Grimskär.

In the northern part the holding ground is not good, the sea is broken, and anchorage is unreliable except near Skägganäs.

Navigable depths.—At Kalmar the navigable channel is very much contracted by islets and shoals; it is, however, kept dredged to admit vessels of 19 feet draft passing through.

Current.—The current in Kalmar Sound is influenced chiefly by the wind, but after a continuous calm usually runs northward. Southerly and westerly gales frequently cause the water to fall, and with northerly and easterly gales the level is higher.

Local magnetic disturbance.—An area in which the magnetic conditions are disturbed extends from about Karlskrona to the eastward of Öland and includes the southern entrance to Kalmar Sound.

Another disturbed area exists over the northern part of Kalmar Sound and extends eastward of Öland. (See Index chart.)

Western shore of Kalmar Sound.—From Torhamns Point to Orranäs, 8 miles northward of it, the shore is of uniform height and thickly wooded. Torhamn Church, situated nearly 1.3 miles north-northwestward of the point, has a high spire. Near Orranäs, openings will be seen, with villages, fields, and small plantations, situated on a ridge parallel with the coast, thence to Kristianopel, 5 miles farther northward, the shore is thickly wooded. The whole

of this coast is foul, and should not be approached nearer than 3 miles, or at night into a less depth than 10 fathoms.

Buoy.—A black and white spar buoy, with a ball topmark is moored on the eastern edge of the shoal ground southeastward of Torhamns Point.

Landmarks.—A large windmill stands on a hill near Ölsång at $1\frac{1}{2}$ miles northeastward of Orranäs.

Kristianopol Church is white, has a square tower with black roof, and can be seen from a considerable distance seaward. There are also two mills at Kristianopol.

Sandhamn is a small bay situated about $1\frac{1}{2}$ miles northward of Torhamns Point, which affords tolerably good anchorage for vessels of 11 feet draft; the anchorage inside Refvet Shoal has depths of 4 to $5\frac{1}{2}$ fathoms, mud and blue clay, but the shelter is not good with winds between south-southwest and east, which send in a heavy swell.

Shoal—Buoys.—The entrance is narrow, but marked on both sides by beacons; the south side of the outermost shoal named Refvet, which breaks, is marked by a red spar buoy with broom over ball, the northwest side by a spar buoy with broom, and the northeast side by a black and white spar buoy.

A shoal with about 17 feet over it lies about 400 yards southward of Refvet Shoal, and on the entrance range for entering Sandhamn Harbor. Depths of 18 feet have been reported between these shoals.

Pilots are obtained from Långören. A pilot steamer is generally stationed near Sandhamn, but may occasionally be absent on other service.

Directions.—Approaching Sandhamn from the southward, Torhamn Church should be brought to bear 315° , and steered for on that bearing, until a white stone beacon, surmounted by a pole with a square top, situated at the head of the bay, is seen; this beacon in line with another white beacon, surmounted by a triangle, a short distance to the northward, bearing 336° , leads southwestward of Refvet Shoal and over a 17-foot shoal to the southward of it, within which there is anchorage, when a pilot must be obtained, if not already on board, as the channel leading to Sandhamn should not be attempted without local knowledge.

Fresh water can be obtained from a spring at Sandhamn Village.

Dangers—Spanstakakullen, on which the sea breaks, situated about $3\frac{1}{2}$ miles northeastward from Torhamns Point and 1 mile from the shore, has on it a depth of 9 feet. The eastern edge of this shoal is marked by a black and white spar buoy, with staff and ball. About $\frac{1}{2}$ mile northeastward of Spanstakakullen lies a small shoal with $2\frac{3}{4}$ fathoms water, and $4\frac{3}{4}$ fathoms close around.

Landbrinken consists of two shoals, with respectively $1\frac{3}{4}$ and $2\frac{1}{4}$ fathoms water, $1\frac{1}{2}$ miles north-northeastward of Spanstakakullen and $1\frac{1}{4}$ miles from the shore.

Outer Stengrund, with $1\frac{1}{4}$ fathoms least water, and 6 to 9 fathoms close around, lies $7\frac{3}{4}$ miles 47° from Torhamns Point, $2\frac{1}{4}$ miles from the shore, and is the most outlying danger off this part of the Swedish coast. Kristianopel Church bearing 0° leads eastward of this grund. A black and white spar buoy, with staff and ball, is moored in $4\frac{1}{4}$ fathoms, on the eastern side of Outer Stengrund.

Lightbuoy.—A black lightbuoy, with a white horizontal band, showing a flashing white light every two seconds, is moored about $\frac{1}{2}$ mile to the southeastward of the Outer Stengrund.

When necessary, on account of ice, the lightbuoy will be withdrawn.

Olsängs, lying $3\frac{1}{2}$ miles southward of Kristianopel, consists of two shoals, the outer with $2\frac{1}{4}$ and the inner with $2\frac{3}{4}$ fathoms of water. A black and white spar buoy, surmounted by two balls, marks the southeastern side of Olsängs outer shoal.

Majö Reef, parts of which are above water, extends nearly 2 miles in a southerly direction from Majö, situated about 1 mile southward of Kristianopel, and terminates in a shoal named Flisan, with 5 feet least water and over 1 mile from the shore.

Råbåden.—Råbåden is a small shoal with 2 feet water, situated about $\frac{1}{2}$ mile southeastward of Majö. Its eastern edge is marked by a black and white spar buoy, surmounted by a ball. The northern mill at Kristianopel, seen well open to the eastward of the church, leads eastward of Råbåden.

Kristianopel.—The town of Kristianopel is situated on a narrow spit which projects about $\frac{3}{4}$ mile in a south-southeasterly direction from the coast. On the east side of this spit lies the harbor, which is narrow and inconvenient, with a depth of 11 feet at mean water level, but will then admit vessels of $9\frac{3}{4}$ feet draft: those of 15 feet draft can anchor in the roadstead, where the depth is $3\frac{1}{4}$ fathoms, sand. These anchorages are exposed to southeasterly winds, and during gales from that quarter a heavy swell sets in. There is a jetty 31 feet long, at which the depth is $6\frac{1}{2}$ feet. Water can be obtained.

Beacons.—Two white stone beacons or cairns, each 8 feet high, stand, one on the mainland northward of the town and the other on the south point of Långaskär, an island lying $\frac{1}{2}$ mile northeastward of the town. Southward of the town is an oak, which serves as a mark.

Lassakullen.—A rocky shoal, named Lassakullen, with $7\frac{3}{4}$ feet least water, marked on its southeastern edge by a red spar buoy,

with upturned broom over ball, lies about $\frac{3}{4}$ mile east-southeastward of Kristianopel; within this shoal the fairway is marked on the western side by black and white spar buoys, and on the eastern by red spar buoys with brooms.

Directions.—When 2 miles distant from Kristianopel, bring the church to bear 303° and steer for it. Then bring as leading mark between the shoals, the point of the eastern gable of the church under the southern opening or window in the tower, which leads southwestward of Lassakullen, and of a broom buoy farther in, and northeastward of a black and white spar buoy which should be closed. When these buoys are passed haul to starboard and anchor in the road, or proceed to the harbor with a pilot.

Northward of Lassakullen there is another entrance which will admit vessels of 6 feet draft.

Coast—Beacons.—The coast between Kristianopel and Bergqvara, 8 miles northward of it, is thickly wooded and possesses no conspicuous landmarks, with the exception of the white stone beacons previously mentioned; a white stone beacon, with pole and rectangular top mark, on Långörs Point, southward of Bergqvara; a solitary fir tree, to which is attached a spar with a black square, about 200 yards westward of the last-mentioned beacon; a white stone beacon, 9 feet high, on a small island named Kârö, eastward of Bergqvara; and Garpen Lighthouse, about a mile farther seaward.

Dangers—Tummen, a rocky shoal nearly 1 mile in extent, awash in one part, and with general depths of $1\frac{3}{4}$ fathoms, lies about $1\frac{1}{2}$ miles east-northeastward of Kristianopel. On the eastern edge of this shoal a black and white spar buoy, with staff and ball, is moored in $3\frac{3}{4}$ fathoms.

Röret, situated 3 miles southward of Garpen Lighthouse, and $1\frac{1}{4}$ miles from the shore, is a narrow rocky shoal nearly 1 mile long north and south, with depths of 1 to $1\frac{1}{2}$ fathoms, and 4 to 7 fathoms close around. About 200 yards northward of Röret, there is a small shoal with 1 fathom water. The eastern edge of Röret is marked by a black and white spar buoy with two balls.

Clearing marks.—Söderåkra Church (about 3 miles northward of Bergqvara), in line 345° with, or open eastward of the beacon on Kârö, leads eastward of these shoals, and Garpen Lighthouse, bearing nothing to the eastward of 0° by day, or the white light from that lighthouse in sight at night, leads eastward of both Röret and Tummen Shoals.

South Garpe Grund, with 5 to 16 feet water, lies about $1\frac{1}{2}$ miles northward of Röret and $\frac{1}{2}$ mile from the shore; it is nearly $\frac{3}{4}$ mile long north and south and $\frac{1}{2}$ mile across the broadest part. On the southern extremity of South Garpe Grund there is a red spar buoy

with ball and down-turned broom, and on the northern extremity a black spar buoy with ball.

Garpen is a small island lying nearly $1\frac{1}{4}$ miles eastward of Bergqvåra; the island is surrounded by reefs, the southern extremity of which is named North Garpe Grund, and is marked by a red spar buoy with ball under an upturned broom.

Light.—From a yellow octagonal tower on square base, 89 feet in height on Garpen, at an elevation of 86 feet above the sea, a flashing white light with red sector, is exhibited, visible 15 miles. For details, see Light List.)

Bergqvåra (Bergkvåra), the best harbor in the southern part of Kalmar Sound, has a depth of 16 feet at mean water level and about 15 inches less at low level, over sand and mud. Farther out the depth is not less than 16 feet.

There are five wharves, of a total length of about 500 feet, with $7\frac{1}{2}$ to 13 feet of water alongside, and partly furnished with railway lines.

Ice obstruction occurs usually in January and February.

The southern entrance to Bergqvåra lies on the western side of South Garpe Grund, and will admit vessels of 13 feet draft; the eastern entrance between South and North Garpe Grund is suitable for vessels of $13\frac{1}{4}$ feet, and the northern entrance admits vessels of $8\frac{1}{4}$ feet draft at mean water level.

Pilots.—Bergqvåra is a pilot station; pilots attend there, and also meet vessels outside the outer shoals. They can not be obtained at night.

Directions — South entrance.—Approach with Söderåkra Church bearing 343° , and when Kärö Beacon is sighted bring it in line with that church 345° , which mark leads eastward of Röret.

Do not stand farther in on this mark without a pilot than to have Garpen Lighthouse bearing 18° .

Eastern entrance.—Approach on a suitable course to pass southward of Garpen Lighthouse, taking care to bring the beacon on the fir tree close southward of the pole beacon on Långörs Point, bearing 265° , before the lighthouse comes in line with the houses of Djursvik, bearing 344° . Steer 265° for the fir tree, passing southward of the red buoy on North Garpe Grund, and northward of the black buoy on South Garpe Grund. Farther in the channel is marked by two red broom buoys on the starboard side and two black and white spar buoys on the port side. After passing the inner red buoy turn to starboard, and when the inner port hand buoy is passed anchor in 16 feet 300 yards from the western shore, or follow the shore north-northwestward 200 yards distant and anchor off the town, avoiding a shoal awash marked by a broom buoy 160 yards from the shore.

Vessels intending to take a pilot for the eastern entrance should heave to on the leading mark, with Garpen Lighthouse in line with Söderåkra Church.

The northern entrance should not be attempted by a stranger without a pilot.

Timber is exported and forage and manure imported.

Bergqvara—Repairs.—There is a small shipbuilding yard where wooden vessels can be repaired.

Communication.—There is a railway and telegraphic communication; also steamboat communication with Kalmar and other places in Kalmar Sound.

Supplies.—Water and a small quantity of provisions can be obtained, but no coal.

Tug.—A tug is available.

Utgrunden—Buoys.—Utgrunden lies near the middle of Kalmar Sound, with its northern end about 6 miles 102° from Bergqvara. It is about 2 miles in extent north and south, and consists of rocky shoals about $\frac{1}{4}$ mile apart. The southern extremity of this ground has a depth of $1\frac{1}{4}$ fathoms, and is marked on its southwestern side by a red spar buoy with two balls under an upturned broom; the northern extremity has a depth of $1\frac{1}{4}$ fathoms, and is marked on its northwestern side by a red spar buoy with one ball under a down-turned broom. Between the two rocky shoals there is a depth of 8 fathoms.

Utgrunden is covered at night by a sector of flashing red light from Garpen, and also by the sector of occulting white light from Ölands South Point Low Light.

Light-vessel.—About 1 mile westward of the middle of Utgrunden a lightvessel is moored in a depth of 10 fathoms; the vessel, painted red with the name *Utgrunden* on sides, has 1 mast, and exhibits at an elevation of 27 feet above the sea a fixed red light, visible 6 miles.

Fog signal.—During thick or foggy weather a steam siren is sounded. Should the siren be out of order, a steam whistle will be sounded; if both siren and whistle are disabled a bell will be rung. (For details, see Light List.)

The coast between Bergqvara and Kalmar is low and wooded with numerous islets and shoals extending 2 to $2\frac{1}{2}$ miles from the shore.

Landmarks.—The most prominent objects on this part of the coast are:

Djursvik, a loading place about 3 miles northward of Bergqvara; the church of Söderåkra, $1\frac{1}{4}$ miles northwestward of Djursvik; the brick works at Värnanäs, 4 miles north-northeastward of Djursvik; and Hagby Church, about $3\frac{1}{2}$ miles northward of Värnanäs.

Djursvik, about 3 miles northward of Bergqvara, is a small harbor only available for vessels drawing $8\frac{1}{2}$ feet at mean level. There is a small loading pier with $6\frac{1}{2}$ feet alongside. Timber is shipped here. Water can be obtained. Pilots for the road are obtained from Bergqvara; fishermen act as pilots for the harbor. The entrance is narrow and tortuous.

Värnanäs, about 7 miles northward of Bergqvara, has a well-sheltered harbor, with depths of 9 to 11 feet, but the entrance only admits of the passage of vessels drawing $6\frac{1}{2}$ feet at mean level. There is good and sheltered anchorage inside Stora Märkören, an island eastward of the harbor, for vessels up to $9\frac{1}{2}$ feet draft, on sand and mud bottom.

There is a small jetty with a depth of $6\frac{1}{2}$ feet alongside; bricks are shipped. Pilots are obtained from Kalmar.

There is steam communication with places in Kalmar Sound, but not with Kalmar.

Ekenäs, nearly $1\frac{1}{4}$ miles northward of Värnanäs has a depth of about 12 feet in the harbor at mean level, with a bottom of mud over clay. Inside the innermost buoy of Mellangrund is anchorage for vessels of 11 feet draft, with good holding ground of clay. There is a loading jetty 62 feet long, with $10\frac{1}{2}$ feet of water alongside, and a smaller one with $9\frac{1}{2}$ feet of water; grain is shipped, and manure and bran landed. There is steam communication as at Värnanäs. Pilots are obtained from Bergqvara or Kalmar by day only.

Beacons.—Two pole beacons stand on the point northward of the harbor; their lower parts are cased with boards and resemble truncated cones. The outer beacon has for topmark a truncated cone, small end upwards, and the inner beacon a similar cone, end downwards. The beacons are 135 feet apart, and when in line bearing 300° lead from sea between the outer shoals.

Kolboda, inside Hagby Point, about halfway between Bergqvara and Kalmar, has a depth of $8\frac{1}{2}$ feet in the harbor at mean level and 2 feet less at low level, over mud. A jetty, 88 feet long, has $6\frac{1}{2}$ feet alongside; pit props are shipped. There is a small shipbuilding yard. The place being of small importance, the approach is not buoyed.

Botorp.—Abreast Botorp, a village about midway between Hagby Point and Stensö Point, lies an islet named Boaskär. The place may be approached by vessels drawing $8\frac{3}{4}$ feet, and the anchorage is from 300 to 400 yards westward of Boaskär. The channel is not buoyed. Pilots are obtained from Kalmar by day only.

Stensö Point, $2\frac{1}{2}$ miles south-southwestward of Kalmar, is low, and has on it a small unpainted stone beacon or cairn.

Dangers—Ut Grund.—Abreast Djursvik, about $1\frac{1}{2}$ miles from the shore, lies a small shoal named Ut Grund, with $2\frac{3}{4}$ fathoms of water, and a depth of 5 fathoms close around. It lies close westward of the western limit of the fixed white sector of Grimskär Light. Ut Grund is marked on its eastern side by a black and white spar buoy, surmounted by two balls.

Between Ut Grund and the shore there are several small shoals with $1\frac{1}{4}$ to $3\frac{1}{4}$ fathoms of water.

Shoal—Buoy.—A shoal of 3 fathoms lies $1\frac{3}{4}$ miles southeastward of Värnanäs, and is marked on its eastern side by a black and white spar buoy surmounted by a ball.

Nischa Grund, with $2\frac{1}{4}$ fathoms of water, lies $\frac{3}{4}$ mile northward of the shoal last mentioned, and nearly $1\frac{1}{2}$ miles east-southeast from Värnanäs. About $1\frac{1}{4}$ miles east-southeastward of this grund lies a small shoal with $4\frac{3}{4}$ fathoms over it, and a depth of 10 fathoms close around.

Baggehall consists of two shoals about $\frac{1}{4}$ mile apart north and south, the southern covered with $1\frac{1}{4}$, and the northern with $2\frac{1}{4}$ fathoms of water; these shoals lie about $1\frac{1}{4}$ miles southeastward from Hagby Point, and have close around depths of 6 to 7 fathoms.

Hagby Grund, with 6 feet least water, and 4 to 6 fathoms close around, lies with its southern end $2\frac{1}{4}$ miles east-northeastward of Hagby Point. It is 1 mile long north and south and $\frac{1}{4}$ mile broad.

Clearing mark.—The eastern part of Kalmar Gaol seen just westward of the Slott (castle) 19° leads eastward of Hagby Grund and also of Hosmo Grund to the northward. A better mark is Kalmar Water Tower, open eastward of Kalmar Slott.

Buoy.—A black and white spar buoy, surmounted by two balls is moored in a depth of $4\frac{3}{4}$ fathoms near the southeastern edge of Hagby Grund.

Shoal.—A shoal, with $3\frac{3}{4}$ fathoms over it, is situated about $\frac{3}{4}$ mile to the southward of Hagby Grund.

Hosmo Grund, situated 2 miles southward of Stensö Point, consists of two shoals, the northern of which is awash, and on the southern there is a depth of $1\frac{3}{4}$ fathoms. These shoals are nearly $\frac{1}{2}$ mile apart north and south, with depths of $2\frac{3}{4}$ and 4 fathoms between. A patch of $4\frac{1}{4}$ fathoms lies $\frac{1}{2}$ mile southward of the southern shoal. The eastern side of the northern shoal is marked by a black and white spar buoy with ball, moored in a depth of $4\frac{3}{4}$ fathoms.

Clearing mark.—Kalmar Water Tower, open once and a half its own breadth eastward of the easternmost tower of Kalmar Slott, leads eastward of Hosmo Grund.

A short distance northward of Hosmo Grund lies Lång Grund, awash. This grund is separated from the reefs extending southward of Stensö Point by a narrow channel with a depth of 5 fathoms.

Shoal—Buoy.—A black and white spar buoy, surmounted by a ball, is moored on the eastern side of a 3-fathom patch, $1\frac{1}{4}$ miles to the south-southeastward of Stensö Point.

At night the fixed white light from Grimskär in sight leads eastward of this shoal and of all to the southward.

Trädgårds Grunden.—Trädgårds Grunden, situated $1\frac{1}{4}$ miles eastward from Stensö Point, is a small shoal lying in the middle of the navigable channel, upon which the least depth is 2 fathoms.

Light buoy.—It is marked on its western side by a red light buoy, showing a *group flashing white* light, with *1 group of 2 flashes* every *6 seconds*. Near and northeastward of the light buoy there is a red spar buoy surmounted by a ball under an upturned broom.

When necessary on account of ice the light buoy will be withdrawn.

Clearing marks.—Grimskar Lighthouse nothing eastward of the chimney of Kalmar steam mill leads eastward.

Trädgårds Grunden is covered by a sector of group flashing white light from Grimskär between the bearings of 4° and 11° . The flashing green light leads eastward and the fixed white westward.

Kalmar Sound Narrows—Light buoys.—A channel has been dredged through the narrows of Kalmar Sound, commencing to the southward of Holmströms Grund and terminating to the northward of Krongrundet. It is 6,566 yards long in a north-northeast direction, 87 yards wide at the bottom, and has a uniform depth of $19\frac{1}{2}$ feet at lowest water. The southern end of the channel is marked by a red light buoy showing a *flashing red* light moored on the eastern side of the channel to the southward of Prästör. The northern end of the channel is marked by a black and red light and bell buoy showing a *fixed white* light, moored in the center of the channel about $\frac{1}{4}$ mile to the northward of the entrance.

The channel between the above light buoys is marked by black buoys on the western side and by red buoys on the eastern side; some of these buoys exhibit lights, as follows: On the eastern side three red light buoys showing *flashing red* lights; on the western side are four black light buoys, showing *flashing green* lights; and, besides these, the two light buoys mentioned below.

A channel into Kalmar Harbor has been dredged to the same depth as the main channel, but its bottom width is only 65 yards. The junction of the two channels is marked by a black-and-white light buoy on each side exhibiting a *flashing white* light every second. When necessary on account of ice the black light buoys on the western side of the channel will be replaced by black marks, and the red light buoys on the eastern side by broom marks, and the red pyramid buoys off Kalmar will be replaced by broom marks, but the northern light and bell buoy will always be maintained.

Shoal—Dangers.—A shoal with a least depth of $3\frac{1}{4}$ fathoms exists 1,220 yards, 147° , from Grimskär Lighthouse and about 160 yards southwestward of the $4\frac{1}{2}$ -fathom shoal shown on the chart.

Owing to the numerous islets, rocks, and shoals the navigation of the narrow channels leading to Kalmar and through the sound should not be attempted without local knowledge.

Prästör, a small, low island, with reefs extending from its eastern and southern sides, lies about 600 yards east-northeastward of Grimskär, on the eastern side of the southern channel leading to Kalmar Roads. This island has on it a white stone beacon, surmounted by a mast with a white square, and an arm pointing westward indicating that the fairway is westward of the beacon. Beacons, serving as marks for the pilots, are erected on Gallbänkarne, Skallöarne, and other rocks.

Pilots.—Kalmar is a pilot station, where pilots may be obtained, also at Grimskär; they meet vessels from the southward off the latter place, and vessels from the northward off the Nyckeln Grund. They have a decked motor boat. There is a pilot signal mast on Grimskär. A black ball with a white band, hoisted at the pilot station, indicates that pilots are available.

Anchorage.—The road, northeastward of the harbor, has a depth of from 4 to 5 fathoms, with good holding ground of clay mixed with stones; it is much used by sailing vessels.

Southeastward of Grimskär there is good anchorage in from 4 to $6\frac{1}{2}$ fathoms, clay.

Northeastward of Nyckeln the depth is 6 fathoms, good holding ground of clay.

Lights—Grimskär.—On a small, low island named Grimskär, at the southern entrance to Kalmar Road, stands a white octagonal wooden lighthouse, 50 feet high, from which two lights are exhibited, as follows:

The upper light, elevated 55 feet above the sea, shows toward the south part of Kalmar Sound a fixed, group-flashing, and flashing white light, with green sector visible 13 miles. (For details see Light List.)

The lower light, elevated 45 feet, shows in a northeasterly direction a fixed, group-flashing, and flashing white light, with red sector, visible 12 miles. This light may be faintly visible through a window on the eastern side of the lighthouse when near it. (For details see Light List.)

About 27 yards northeastward of the main lights, from an iron stanchion, a fixed white and red light is exhibited at an elevation of 41 feet above the sea. The limits of the sectors are not distinctly defined. (See Light List.)

Kalmar.—Two fixed red lights, elevated 10 feet, are shown at the harbor and lead through the middle of the entrance channel.

Range lights, front fixed white, rear occulting white, 135 yards apart, and bearing 285° when in line, are shown when mail steamers arrive and leave.

Fog signal.—During thick and foggy weather a hand fog horn is sounded at Grimskär.

Light buoys—Signals.—Should any of the light buoys in Kalmar Sound be observed from Grimskär Lighthouse to be out of position, or to be missing, the undermentioned signal will be made from the southern side of the lighthouse, at a height of about 7 feet above the ground, for the guidance of vessels approaching from the southward:

By day, a red circular disk 3 feet in diameter; by night, a fixed red light. Caution should be observed in navigating the deep channel through the sound.

Kalmar Harbor is about 800 yards long north-northeast and south-southwest, with a greatest width of about 400 yards, and is sheltered on the eastern side by breakwaters, between the northeastern parts of which is the entrance, about 56 yards wide. The northeastern part is dredged to a depth of $19\frac{1}{2}$ to $21\frac{1}{2}$ feet at low-water level, so that vessels able to pass through the narrows can enter that part of the harbor; part of the southern portion has $14\frac{3}{4}$ to $21\frac{1}{2}$ feet, and the remainder of the harbor has depths from $7\frac{3}{4}$ to 18 feet at low level.

In the middle of the harbor is a shoal awash, marked by a black and white spar buoy on the northeastern and a broom buoy on the southwestern end. The southwestern entrance is filled up.

Round the harbor, and on Ballastholm, in the southwestern part, as well as the southern breakwater, are quays of a total length of 4,046 yards, with depths from $3\frac{1}{4}$ to $19\frac{1}{2}$ feet alongside at low level. Only the two northeastern breakwaters, about 320 and 105 yards long, respectively, lack quays. There is a 12-ton crane.

The harbor is generally closed to sailing vessels by ice from January to March, but for steamers ice obstruction seldom occurs, as the channel is kept open by ice breakers. However, the south or the north part of Kalmar Sound may sometimes be altogether blocked by ice. In 1909 the port was closed by ice from February 10 to March 25; since then a new powerful ice breaker has been obtained, which, it is expected, will keep the sound open. In 1912 navigation was closed from February 8 to March 15.

Kalmar, the principal town in Småland Province, and one of the oldest in Sweden, has (1914) a population of about 15,955. The greater part of the town stands on an island named Qvarnholm,

which is connected with the mainland by bridges. It has several buildings which can be seen for some distance seaward; the most conspicuous are the high chimney of a steam mill; the cathedral with its four spires; the water tower; an old castle with four towers standing on a small island just southwestward of the town and the gaol.

Coal.—Upward of 50,000 tons of coal are imported annually, and 3,400 tons are usually kept in stock. There is a coal wharf, 500 feet long, alongside which there is a depth of 17 feet.

Patent slip.—See Appendix I.

Repairs can be effected to hull and machinery of wooden vessels by one shipyard. A salvage vessel is stationed at Kalmar during the greater part of the year. Tugs are available.

Trade.—The exports consist of timber, pit props, deals, joinery, matches, hides, and farm produce; and the imports of coal, salt, wheat, rye, rice, manure, machines, oil cake, and petroleum.

Kalmar Harbor—Regulations.—The outer boundary of the harbor area is a line drawn from the island on which Kalmar Castle is situated to the town boundary toward Skalby Royal dairy farm, and the area includes Slottsholmarne, Barlastholm, the harbor area inside the piers, Laboratorie, and Varfsholmarne; also Engo and Kullo.

Vessels arriving must be careful to obey implicitly all orders concerning quarantine, customs, pilotage, etc., and other orders affecting seamen.

Colors must be shown during daylight until after the customs examination; speed must not exceed that necessary for maneuvering, and both anchors must be ready for letting go.

The directions of the harbor pilot must be strictly followed. Vessels must not anchor in or off the entrance channel, except in case of necessity, in which case the vessel must be warped without delay into the position pointed out by the responsible authority.

If it is not possible to moor during daylight, the stay lights must be shown and a watch kept on deck.

Only small boats may lay at the quay steps, and they must be secured bow on to the steps.

The vessel's arrival, with necessary details as to cargo, explosives, or inflammables on board, must be reported at the harbor office immediately after the customs examination, stating whether anyone is suffering from venereal or other contagious disease.

This rule does not apply to men-of-war, who will be visited by the harbor master, and certain other classes of vessels not carrying cargo are also exempted.

Vessels will be shown a berth by the harbor master, at which she must be moored, and not shifted without the harbor master's permission.

Should the harbor master require, its davits, etc., must be turned in before going alongside. Vessels must be provided with fenders and moored to the rings or bollards.

Anchor must not be used without permission.

When mooring in the harbor a harbor pilot must be employed.

For further details and rules as to working cargo, ballast, etc., prevention of fire, directions in case of fire, and all other matters affecting vessels in the port, the harbor regulations, as published, which are supplied gratis in Swedish, and price 75 ore in English, should be consulted.

Communication.—Kalmar is connected by railway with Karlskrona, Stockholm, and the interior. There is a telegraph and telephone station, and communication by steamer to Stockholm, Norrköping, Copenhagen, Christiania, Lübeck, and places between, also with the harbors in Kalmar Sound.

Supplies.—Provisions are plentiful. Water is obtained from a hose over the quay.

Directions from southward.—When approaching Kalmar sound from the southwestward Utklippan Lighthouse should be sighted and a departure taken therefrom. Approaching from the southward or southeastward the lighthouse on the south point of Öland and Ottenby wood will be first seen. Ölands Reef can not be approached by the lead from the southwestward or westward, and at night or in thick weather the water on either side of the sound should not be shoaled to less than 10 fathoms while southward of Utgrunden; northward of that shoal the Swedish shore may be approached to 8 fathoms and the Öland shore to 6½ fathoms. Vessels may pass either eastward or westward of Utgrunden.

From a position about 1¼ miles westward of Utgrunden Light Vessel a 16° course leads to the southern entrance of the dredged channel off Kalmar, passing between the shoals on either side, and westward of Trädgårdsgrunden.

From close westward of the light vessel a 12° 30' course leads to Grimskär, passing close westward of Trädgårdsgrunden. Kalmar Slott will generally be seen before the lightvessel is sighted.

To pass eastward of Utgrunden from a position 2 miles westward of the lighthouse on the south point of Öland, steer 359°, which leads over 1¼ miles eastward of Utgrunden and ½ mile from the shoal water extending from Öland, to avoid being set toward which the position should be frequently checked by bearings. When abreast

Mörbylänga steer to bring Grimskär Lighthouse to bear 16° , and steer for it. A pilot can be obtained from Bergqvara or Grimskär.

At night.—The position having been fixed by bearings of Utklippan, Utlängan and Ölands Sound Point Lights, shape a course to pass about 1 mile westward of Utgrunden Light Vessel, and when Garpen Light changes from white to red alter course to 16° . Shortly after Utgrunden Light is lost sight of Grimskär Light will, in clear weather, be seen ahead, when steer for it, keeping in the fixed white sector, which leads close westward of Trädgårdsgrunden Light Buoy.

To pass eastward of Utgrunden, steer to enter the sector of fixed white light from Ölands South Point between the bearings of 159° and 172° and continue in it on a course about 345° until within the fixed white sector of Grimskär Light, when proceed as above directed.

The coast between Kalmar and Skägganäs Island, about 6 miles north-northeastward from it, is low, densely wooded, and has several islets, rocks, and shoals extending some distance from the shore.

Dangers—Krongrundet—Buoy.—The fairway northward of Kalmar is divided into two channels 700 yards southward of the light and bell buoy by a shoal with 5 feet least water and 2 fathoms on the western end named Krongrundet: it is marked near the eastern extremity by a black and white spar buoy, surmounted by a white and a black ball. On the western end of the shoal is one of the channel light buoys, a red buoy showing a flashing red light.

Krongrundet is covered by a sector of flashing red light from Grimskär, except the western extremity, which extends into the fixed white sector of light from that lighthouse.

West side of channel—Nyckeln—Buoy.—Nyckeln is a shoal with a depth of $1\frac{1}{2}$ fathoms, lying about 400 yards westward of Krongrundet, marked on its northern side by a red spar buoy, surmounted with a ball and downturned broom.

About 250 yards northward from Nyckeln there is a 2-fathom shoal, marked by a black and white spar buoy.

About 1,800 yards northward of the eastern end of Krongrundet is a shoal of 3 fathoms.

Anchorage.—On the flat northward of the entrance to the dredged channel there is anchorage in from $4\frac{1}{2}$ to 9 fathoms, clay; shelter from northerly winds may be found in from $3\frac{3}{4}$ to $5\frac{1}{2}$ fathoms, clay, by steering 14° from the light and bell buoy until Borgholm Castle Ruin is in line with Refsudden, avoiding the 3-fathom shoal just mentioned.

Masknaggen—Buoys.—Masknaggen, situated near the middle of the sound, $2\frac{1}{2}$ miles northeastward of Krongrundet, is 800 yards long east and west, with $1\frac{1}{4}$ fathoms least water upon it, and depths of $3\frac{3}{4}$ to 10 fathoms close around. The eastern end of Masknaggen is marked by a black spar buoy with ball; the western end by a red spar

buoy with broom. The shoal is covered by a sector of fixed red light from Skägganäs.

A shoal, with $1\frac{1}{2}$ fathoms water, lies about 1 mile northeastward of Masknaggen, and a patch of $2\frac{1}{2}$ fathoms, about 200 yards southeastward from its southern end, is marked on its northeastern side by a black spar buoy with two balls. The $2\frac{1}{2}$ -fathoms patch lies about 1,600 yards westward of Ispendde. About midway between Masknaggen and the last-named shoal is one of $3\frac{1}{2}$ fathoms, distant about 1 mile from the Öland Shore.

Silläsarne (Silläsarne)—**Buoy**.—Silläsarne consists of two shoals, the southern with $2\frac{1}{2}$ and the northern with 2 fathoms; a spar buoy with upturned broom marks the western side of the northern shoal.

Hatten, a shoal with $1\frac{1}{2}$ fathoms least water, lies about 300 yards northward of Silläsarne, with its southern end about $\frac{1}{2}$ mile southeastward of Refsudden; it is marked on its southeastern side by a black spar buoy with ball.

Bredgrund, with 2 fathoms on it, lies 1,400 yards northward of Masknaggen, and is marked on its eastern end by a black spar buoy with ball. Bakaregrund lies 700 yards northward of Bredgrund, has a least depth of 1 fathom, and is marked on the eastern side by two black spar buoys, the northern of which has a ball. A detached patch of $2\frac{1}{2}$ fathoms, 200 yards eastward of Bakaregrund, is marked by a spar buoy with cross. Farther northward reefs and shoal water extend for 1.2 miles eastward from the south point of Skägganäs.

About 600 yards eastward of Bredgrund is a shoal of $1\frac{1}{2}$ fathoms, marked on its northwestern end by a red spar buoy with upturned broom.

Skägganäs is low and wooded, but easily recognized, from its dark color and prominent position. It is separated from the mainland by a cut through a narrow isthmus. On Refsudden, the southeastern extremity, there are several houses and a pilot station, northward of which stand two beacons indicating the direction of the telegraph cable between Skägganäs and Öland. From the southern point of Skägganäs a spit projects 600 yards in a southwesterly direction, having on it several houses.

Pilots.—Pilots look out at Refsudden: a back ball with a white band indicates that pilots are available. There is a decked motor-boat.

Södra Dragsviken, between the south part of Skägganäs and the mainland, has a depth of 13 feet at mean water level, and about $11\frac{1}{4}$ feet at low level, over mud and clay. Vessels of $10\frac{1}{2}$ feet draft can enter at mean level, leaving spar buoys with brooms to starboard and plain spar buoys to port. There is a jetty about 20 yards long,

with 5½ feet alongside at mean level; wood is shipped. Pilots are obtained from Kalmar or Skägganäs.

Light.—From a tower on the eastern part of a red dwelling on Refsudden, a fixed light, with white, red, and green sectors, is exhibited at an elevation of 33 feet above the sea, visible 11 miles. (For sectors, see Light List.)

Bell buoy.—A black and white bell buoy is moored about 1,200 yards eastward from the light on Refsudden, and close to the telegraph cable from Skägganäs to Öland. Removed when necessary, on account of ice.

The coast between Skägganäs and Vällö, about 19 miles north-northeastward of it, is low, wooded, and has numerous off-lying islands, rocks, and shoals, some of which extend 3 miles from the shore. The islands are more densely wooded than the mainland, and can be easily distinguished. At Pataholm, about 7 miles northward of Skägganäs, the Alster River empties itself; and near Mönsterås, 7 miles northward of Pataholm, the coast forms a fjärd extending a considerable distance inland; northwestward of this fjärd there is a solitary hill 203 feet high, named Kafvershall.

Liungnäs, situated 2 miles northward of Skägganäs, has a depth of 11¾ feet. The south channel leading to this port lies between the reefs extending from the northern end of Skägganäs, and a small island named Bäkne Storkalf.

Hästenäs lies about 2½ miles northward of Liungnäs, and also has a depth of 11¾ feet; the channels leading to these ports are narrow, with numerous shoals, are not buoyed, and should not be attempted without local knowledge.

New (Ny) Grund is a shoal with a depth of 3 fathoms, situated 2¼ miles, 43°, from the northern extremity of Skägganäs.

Buoys.—New Grund is marked on the eastern side by a black and white spar buoy, surmounted by a ball.

Eastward of Enskärsref, extending from Ryssby Enskär, 2¼ miles to the northward of New Grund, in the fairway to Pataholm, a black and white spar buoy surmounted by a ball is moored. These shoals are covered by a sector of green light from Skägganäs.

Patslan—Beacon.—Patslan is a small, low island, situated on the northern side of the entrance to Pataholm; on this island stands a white beacon 13 feet high, having on it a staff with cross. The southern edge of the reef surrounding Patslan is marked by broom buoys. Pata Enskär is a small island over ½ mile northwestward from Patslan, and may be easily recognized by its dark plantation.

Refsudden Light, bearing 202°, leads eastward of all dangers between Skägganäs and Patslan.

Pataholm—Anchorages.—In the inner road, ½ mile outside the town, vessels of 15¾ feet draft can load.

In the outer road, 1 mile from the town, the depth is 23 feet.

There is good anchorage westward of Patslan in from 5 to 6½ fathoms, clay, and one can anchor anywhere in the channel up to the roads. Vessels drawing 21 feet can enter by the southeastern channels, and those drawing 8 feet by the channel inside the islands.

Pilots.—Pataholm is a pilot station; pilots keep a lookout at Saltor, an island about 1½ miles southeastward of the town, and meet approaching vessels outside Patslan by day only.

Directions.—When approaching from the southward, Enskärshuf is avoided by bringing Skägganäs Light nothing southward of 202°, until Patslan Beacon is in line with the western part of Vaderö, which leads northeastward of it. When 2 miles distant from Patslan Beacon, bring it in line with the eastern side of Pata Enskär, bearing 329°, which leads southwestward of Yttre Patslan, a shoal of 1½ fathoms, marked on its southwestern side by a red spar buoy with upturned broom over a ball. When Köping Church on Öland is in line with the outer end of Borgholm Mole, bearing 95°, steer westward, leaving on the port hand a shoal of 1¼ fathoms, marked by a black and white spar buoy, and another shoal of 1½ fathoms similarly marked: and on the starboard hand, two red spar buoys with brooms, southwestward of Patslan, and a red and black spar buoy with cross a little farther on. Having passed the latter buoy, turn northward and anchor in about 6 fathoms to wait for a pilot, if one is not on board.

Approaching from the northward, when 1½ miles from the entrance, steer a westerly course to pass well southward of Patslan Beacon, leaving to port the Bådan Shoal of 2 fathoms, marked on its northern side by a black and white spar buoy. When the beacon comes in line with the eastern side of Pata Enskär, haul to the northward and follow the previous directions.

Pataholm Harbor has a depth of 5¾ feet only: at the town quay, which is 303 yards long, the depths are from 5¾ to 2 feet. At the inner wharf the depth is 5¾ feet and at the outer 10¾ feet. The depths are those at mean-water level; at low level they are 2 feet less.

Pataholm, a small town on the mainland about 9 miles northward of Skägganäs Lighthouse, has steam communication with Kalmar, Oskarshamn, and other places in Kalmar Sound. Wood is exported and manure and feeding stuffs imported. Some provisions can be obtained, and fresh water can easily be procured from the Alster River.

Vaderö (Väderö), situated 2 miles northeastward of Pataholm, and about ½ mile from the shore, is wooded, and surrounded by a reef named Väderbåden, the northeastern end of which is marked by a black and white spar buoy. There are several shoals eastward of Vaderö, some of which lie 3 miles from the mainland shore.

Approach to Timmernabben — Dangers — Buoys. — Stor Grund, with 6 feet water, lies about 1 mile eastward of the southern end of Vaderö, and is marked on its northwestern and southern extremities by pole beacons with brooms.

North Bengtsan, with 6 feet water, lies $\frac{3}{4}$ mile northeastward of Stor Grund, and has on its southeastern side a red spar buoy with an upturned broom over a ball. South Bengtsan, southward of the last-mentioned shoal, has $1\frac{3}{4}$ fathoms on it, and is marked on its northern side by a black and white spar buoy. The main-entrance channel to Timmernabben lies between them.

Sandgrund, a shoal of $1\frac{3}{4}$ fathoms, unmarked, lies about $\frac{1}{2}$ mile northeastward of North Bengtsan.

About 1 mile eastward of Bengtsan there are two shoals lying north and south of each other and $\frac{1}{2}$ mile apart: the southern shoal has a depth of 3 fathoms, with 8 to 9 fathoms close around, and the northern $3\frac{3}{4}$ fathoms, with a depth of 10 fathoms close around. The southern shoal is marked on its eastern side by a black and white spar buoy surmounted by a ball.

About $\frac{1}{2}$ mile northeastward of Vaderö lies Nysten Grund, on which the sea breaks: the southern end of this grund is marked by a red spar buoy with broom. Southeastward of Nysten Grund are two shoals of $1\frac{3}{4}$ and $3\frac{1}{4}$ fathoms, the former of which is marked on its northern side by a black and white spar buoy.

Mann Grund forms the outer reef abreast Timmernabben. On this grund stand two small, low islets, of a yellow appearance and partially covered with bushes. These islets are known as the North and South Mann Grund: within 1 mile eastward of the Mann Grund there is a shoal with 9 feet least water, marked at its northeastern end by a black and white spar buoy surmounted by a ball.

Beacons.—On Matske Island, situated southward of Löfö and in the approach to Timmernabben, is a white stone beacon or cairn with red band and 13 feet high, over and around which are poles supporting two triangular boards, points toward each other, the upper white and the lower red, the whole 24 feet high.

Gissemåla Ek, an oak tree with a white board on top, stands near Tillingenabben.

Pilots.—Timmernabben is a pilot station: pilots attend on Matske and (in the daytime only) meet approaching vessels at the outer shoals. As the pilots have some distance to go vessels can take a pilot from Skägganäs or Vällö until a Timmernabben pilot comes on board.

Depths.—In the inner road at Timmernabben the depth is 12 feet, sand and stones, but farther out the depth is 16 feet. Vessels of 15 feet draft can enter by the main channel, and those of 13 feet

by the southeastern channel. The channel from Mönsterås, inside North Mann Grund, is available for vessels of 6½ feet draft. At low water level the depths are 2 feet less.

Directions.—Approaching the main entrance to Timmernabben, steer for Oknö Point, the southeast point of Stora Oknö, in line with North Mann Grund, bearing 347°. Oknö Point has a pilot's watch house on it, and off it lies a bare, light-colored island named Oknöskär, with a solitary wide-spreading tree on its highest point, behind which a row of poplars on Björnö is seen. Continue on the above mark until Gissemåla Ek is open northward of Matske Beacon, bearing 295°, which mark leads between South and North Bengstan, afterwards passing a black and white spar buoy marking a shoal on the port hand. Having passed this buoy turn to starboard and anchor in from 3½ to 8 fathoms, and wait for a pilot if one is not on board, as the channel farther in, passing between the southern end of Löfö and the reefs extending from the mainland is narrow and tortuous, with numerous dangers in it.

From the northward, steer for the northern part of Vaderö on a 256° bearing, which leads northward of Sandgrund, taking care not to approach the shoal lying eastward of Mann Grund within ½ mile, and not to bring the two Mann Grunden in line before Gissemåla Ek is in line with or open northward of Matske Beacon, when wait for a pilot.

Southeastern entrance.—To enter southward of Stor Grund, bring Borgholm Lighthouse on Kråk Point right under the northern corner of the middle part of the west front of Borgholm Castle, bearing 130°, and with this mark astern, steer toward the northeastern part of Vaderö, leaving three broom buoys to starboard, the two inner ones being on Stor Grund. When Patslan Beacon opens eastward of Skäggenäs, turn to starboard, and gradually bring Mönsterås Church over a pronounced wooded point on an islet close eastward of and apparently forming part of Löfö; follow this mark until Gissemåla Ek comes in line with Matske Beacon, when wait for a pilot.

Several shoals of from 1 to 2½ fathoms lie in this channel, of which only the 1-fathom shoal is marked by a black and white spar buoy, consequently strangers should not attempt it without a pilot.

Timmernabben, situated 3½ miles northward of Pataholm, is a small village on the mainland westward of Löfö. There is a jetty, 30 feet long, with 7½ feet of water alongside; wood is shipped here. It is stated that there is a depth of 12 feet at the wharf. Water and a small quantity of provisions can be had. Wooden vessels can be repaired. There is steam communication as at Pataholm. A customs station is at Timmernabben.

Tillingenabben, $\frac{3}{4}$ mile southward of Timmernabben, has 13 feet in the harbor at mean level; there is a jetty, 55 yards long, with $7\frac{1}{2}$ feet alongside.

Stora Oknö is densely wooded, and situated on the southern side of the entrance to Mönsterås. Southward of the range light beacons stands a white pilot's watch house, with the word "Lots" on it in black letters. On the northern part of this island there are several houses, and on a rock named Stenskär, just northward of Stora Oknö, there is a white stone beacon.

Range lights.—Two fixed red range lights are exhibited from poles with white square boards on the eastern end of Stora Oknö, which, in line bearing 269° , lead through the entrance channel from seaward.

Approach to Mönsterås.—The entrance to Mönsterås harbor lies between Stora Oknö and Björnö $\frac{3}{4}$ mile northward of it. The channel is narrow and passes northward of the black spar buoy with one ball on the Ytter Grund, which has a depth of about 4 or 5 feet water. About $\frac{3}{4}$ mile eastward of the Ytter Grund there is a shoal of 2 fathoms, marked on its northern side by a black and white spar buoy surmounted with two balls.

Lights—Mönsterås.—Two fixed red range lights are exhibited in the town which in line, bearing 309° , lead through a straight channel $\frac{3}{4}$ mile long, marked on the northeastern side by nine red broom buoys and on the southwestern side by four black and white spar buoys.

In addition to these, the approach to Mönsterås is lighted by various small white, red, and green lights, which, together with those at Mönsterås, are exhibited from July 6 to June 6.

Pilots.—Mönsterås is a pilot station; pilots attend on Stora Oknö and meet approaching vessels outside the shoals and outgoing vessels in the harbor. In bad weather a pilot should be sought at Skägganäs or Vällö, to assist until the Mönsterås pilot comes on board. At Mönsterås pilots can not be obtained at night.

Directions.—Gåsö Beacon in line with the eastern end of Svartingskär leads eastward of the shoals outside the entrance to Mönsterås. When $2\frac{3}{4}$ miles off, bring the range light beacons in line bearing 269° , and steer in between the shoals, leaving red broom buoys to starboard, and black, and black and white buoys to port, until abreast Svartö, $\frac{1}{2}$ mile eastward of Oknö Point, where, even in on-shore gales, a pilot can be taken. The channel then bends northward, and the services of a pilot are indispensable.

At night the red range lights on Stora Oknö, in line bearing 269° , lead in between the shoals.

Mönsterås.—The village of Mönsterås, situated about halfway between Skägganäs and Oskarshamn, lies near the head of the fjärd,

about $3\frac{1}{4}$ miles from the entrance. The harbor has a depth of 9 $\frac{1}{2}$ feet at mean level, and there is the same depth alongside the quay, which is about 208 yards long and furnished with railway lines. In the road, about 2 miles from the town, the depth is about 19 feet, and vessels of 17 $\frac{1}{2}$ feet draft can enter; the depth is $1\frac{1}{2}$ feet less at low-water level.

Supplies.—Provisions, water, and a small quantity of coal can be obtained.

Communication is maintained by steamer with Kalmar, Oskarshamn, and other places in Kalmar Sound; there is railway and telegraphic communication.

A tug is available.

Trade.—Exports consist of wood, grain, and matches; imports, manures, etc.

Svartingskär Grund lies $\frac{1}{2}$ mile eastward of Svartingskär and nearly 2 miles southwestward of Dämman Light. Its eastern edge is marked in a depth of $3\frac{1}{4}$ fathoms by a black and white spar buoy with black ball.

Dämman Light bearing 27° , or the single white flash at night, leads eastward of all shoals between Svartingskär Grund and Mann Grund.

Dämman Shoal—Buoys.—Dämman Shoal, on which the sea breaks, has close around it depths of 5 and 6 fathoms. On the southern side of the shoal is a rocky islet, about 15 feet high, on which is a dwelling. A black and white spar buoy with black ball is moored in a depth of $4\frac{1}{4}$ fathoms on the northeastern side and a broom buoy on the western side of this shoal.

A shoal with $2\frac{1}{4}$ fathoms on it is situated 1,400 yards 217° from Dämman Lighthouse.

Light.—From a tower above a red dwelling 39 feet high on the islet on the south side of Dämman Shoal, at an elevation of 58 feet above the sea, a fixed, flashing and group flashing white light, with green sector, is exhibited, visible 13 miles. (For details see Light List.)

Fog signal.—During thick and foggy weather a fog siren, worked by compressed air, is sounded.

Pilots can usually be obtained from the pilot boat which generally cruises between Dämman and Vällö.

Gåsö is a small and partially wooded island situated about $2\frac{1}{2}$ miles northwestward from Dämman Lighthouse. Between Svartingskär and Gåsö there are numerous shoals, with 9 to 13 feet water over them, some of which are marked by spar buoys.

Vällö.—Vällö, the largest of a group of islands lying near the coast northward of Dämman, is thickly wooded and easily recognized from the northward or southward. From Vällörump, the eastern

part of the island, shoal water extends 600 yards; northward of Vällö there are several wooded skerries surrounded by shallow water, the principal of which are named Enskär, Tacktö, and Sandö. Sillkroken is a small island $\frac{3}{4}$ mile southward of Vällö.

Kungsholm is a small island in the channel between Vällö and the mainland, and situated about 700 yards west-southwestward from the southwestern point of Vällö.

A black and white spar buoy with ball is moored off the northeastern end of the shoal extending eastward from Vällö, and a red spar buoy with broom marks the end of the shoal extending $\frac{1}{2}$ mile southward of the southeastern point of the island.

Beacons.—On the eastern side of Gäsö is a stone beacon, 13 feet high, surmounted by a cross.

Lilla Sillkroken, south of Vällörump, has a white beacon with two red sloping bands.

On the western part of Vällörump there is a white beacon with pole and stays, with a triangular board on top.

Örskär, between the Vällö Group and Runö, has a white cairn beacon with a pole and triangular board on top, the whole 49 feet high. The stays are covered with white boards.

Pilots.—Vällö is a pilot station; pilots attend on Vällörump, and meet vessels north and south of it.

Vällö Channel, between Vällö and the mainland, is considerably contracted by numerous rocks and shoals; in some parts the navigable channel is not more than 200 yards wide.

Vällö Road, from 200 to 600 yards northwestward of Kungsholm, has a depth of from $5\frac{1}{2}$ to 6 fathoms, with a bottom of mud and clay. A jetty, 79 feet long, with $9\frac{3}{4}$ feet alongside at mean level, is situated at the southwestern point of Vällö.

Navigable depths.—The southern entrance to Vällö Channel can be used by vessels of $11\frac{1}{4}$ feet draft, the eastern entrance by those of $17\frac{1}{4}$ feet, and the northern by those drawing $16\frac{1}{4}$ feet. At low level there is 1 foot less water.

The southern entrance (Gäsöleden) to Vällö Channel leads between Svartingskär and Dänman Shoal, thence between Gäsö and Gäsöbåden. It should not be attempted without local knowledge.

The eastern entrance passes between Gäsö and the shoals extending southward of Sillkroken. When approaching this entrance from the southward, after passing northeastward of Dänman Shoal at a convenient distance, steer for Svartö Hamlet on a 290° bearing, passing southward of Ny Grund of $2\frac{1}{2}$ fathoms marked on its southern side by a red spar buoy with two brooms and a shoal of 2 fathoms, marked by a red spar buoy with one broom, together with a 16-foot shoal southwestward of it. When abreast Gäsö, wait for a pilot if one is not on board. The leading mark then, Åsehorn in line with

the southern point of Kungsholm, bearing 312° , will lead into the narrow channel, in which are several newly discovered shoals, some of which are near the leading line, and the channel should not be continued without a pilot or local knowledge.

The northern entrance lies between Sandö and Runö, 1 mile northwestward of it. Oskarshamn Church, open eastward of Rödskär, northward of Runö, leads northeastward of all shoals north of Vällö, the outermost of which is Klockarn, with $3\frac{1}{2}$ fathoms, marked by a black and white spar buoy with two balls. Approaching this entrance from the northward, steer for the beacon on Örskar, an islet westward of Sandö, in line with the western side of a large rock on the same islet, bearing 206° ; pass 200 yards eastward of it and steer southward toward the northern point of Sandreholm, nearly $\frac{1}{2}$ mile southwestward, to bring the highest point of Jungfrun Island, in the northern part of Kalmar Sound, over the western slope of Örskar, bearing 48° , which mark astern leads between Storgrund, marked on its eastern side by a black and white spar buoy, which is left to starboard, and the northern point of Sandreholm to port. When past the buoy steer for the broom buoy on Sandreholm Reef and pass westward of it, and steer toward Åsehorn until Kungsholm is just open eastward of Hamnskär, an islet 800 yards northward of Kungsholm, bearing 162° , which leads westward of Nordstagrund, marked on the western side by a broom buoy. From Nordstagrund steer for the small island named Vesterskär. Should there be no pilot on board, anchor in a depth of 6 to 8 fathoms, clay, northward of this island, avoiding a shoal of $3\frac{1}{2}$ fathoms, 600 yards north of it, and wait for one.

Eum, a village situated on the mainland about 2 miles south-southeastward of Paskallavik, has $3\frac{1}{2}$ fathoms in the anchorage, but the holding ground is bad. Small craft can anchor nearer the shore. Vessels drawing 14 $\frac{1}{2}$ feet can reach the outer anchorage. Pilots are obtained from Vällö.

Paskallavik (Paskallavik) is situated on the mainland abreast Runö. In the road the depth is 6 to 7 fathoms, over mud, clay, and rock. Vessels of 15 feet draft can proceed to this bay by the channel southward of Runö, and those of 11 $\frac{1}{2}$ feet draft can enter by the northern channel between Runö and Storö, $1\frac{1}{2}$ miles northward of it. In the northern entrance, $1\frac{1}{2}$ miles from the town, Flötens Beacon, surmounted by a round white board, is erected on a rock, and when in line with Paskallavik Church, bearing 227° , leads to the entrance. These channels are too intricate to be navigated without local knowledge.

The well-sheltered harbor has a depth of 14 $\frac{1}{2}$ feet and 16 inches less at low-water level. A wooden quay 142 yards long has about the

same depth alongside at mean level. Ice obstruction generally occurs from January to March. Water and a small quantity of ship's requisites may be procured, and necessary repairs to wooden vessels can be effected.

Pilots.—Päskallavik is a pilot station. Pilots meet in-coming vessels outside the black spar buoy with ball lying eastward of Storö, or they may be obtained from Vällö by day or from Furön. They can not be obtained off Päskallavik at night.

Communication by steamer with Norrköping, Göteborg, and places between; also with Oskarshamn and other places in Kalmar Sound. There is telegraphic communication.

Trade.—The exports consist of stone, wood, and paper; imports are coal, woodpulp, clay, and lime.

There are loading jetties, with depths mentioned alongside, at the following places northward of Päskallavik where small vessels load granite and discharge coal: Marseholm, 1,200 yards from Päskallavik village, 14½ feet, with 14-ton crane; Kessels and Röhls, 1,800 yards from the village, 9½ feet, with 10-ton crane; Norra Vånevik, 1½ miles from the village, 8½ feet, with 10-ton crane; and Näset, 1½ miles from Päskallavik, 9½ feet, with 10-ton crane. At the latter place there is ice obstruction from December to the middle of April.

Oskarshamn.—About 6 miles northward of Päskallavik lies a bay named Doderhultsvik, 1 mile deep and ½ mile wide at its entrance. At the head of this bay the town of Oskarshamn is situated.

Navigable depths.—Vessels of 12½ feet draft can proceed to Oskarshamn Harbor by the southern channel; those of 21½ feet by the southeastern channel by day; those of 21½ feet by day and 16½ feet by night through the eastern entrance north of Fatbottens Grund, passing southward of Furön; and those of 14½ feet through the channel to the eastern entrance, passing north of Furön. Vessels of 23 feet draft can enter by the southeastern channel and also by the eastern, passing southward of Furön, but only as far as the anchorage eastward of Grimskallen South Light. At low-water level the draft should be 16 inches less.

Beacons.—Grimskallen Beacon on the northern shore of the bay, about 250 yards southwestward of Grimskallen South Light, is conical, white, and 13 feet high.

Klubben Beacon, on an islet on the southern side of the entrance to the bay and 1,600 yards eastward of the town, is a pale 44 feet high, with a white disk as top mark and stays covered with white boards.

Ålgårdskär (Ålgårdskär) Beacon, on a small islet close to the shore about a mile south-southeastward of Klubben Beacon, is 13 feet high, and white with a red band.

Dangers—Flatbottens Grund, situated in front of the entrance to Oskarshamn and 2 miles eastward of Klubben Beacon, is 1½

miles north and south and $\frac{1}{4}$ mile broad, having on it numerous shoals, one of which on the western side is awash, and others on the north side and in the center have only from 3 to 6 feet of water on them.

Buoys.—The southwestern end of Flatbottens Grund is marked by a red spar buoy with up-turned broom over a ball. The northern side is marked by a black and white spar buoy and a black spar buoy with ball eastward of it; the eastern side by three black and white spar buoys, the middle one, which is the outermost, with two balls; and the west side by two red spar buoys with brooms, the northern of which is southwestward of the spot awash.

When necessary, on account of ice, the balls will be removed from the marks in the vicinity of Oskarshamn.

Clearing marks.—Rödsjär in line with the highest and outermost clump of trees on the eastern point of Runö, bearing 206° , leads eastward, and Klubben Beacon, in line with the northern side of Ljusberget, a bare, light-colored rock eastward of the beacon, bearing 260° , leads northward of Flatbottens Grund. The white sector of Furön Light clears to the eastward.

Other shoals—Buoys.—A shoal, with a depth of $2\frac{3}{4}$ fathoms over it, lies northeastward of Flatbottens Grund. A spar buoy, surmounted by a cross, marks it.

A shoal of 3 fathoms lies in the middle of the eastern entrance channel, close northward of Flatbottens Grund, and another of $2\frac{1}{2}$ fathoms, marked by a red broom buoy, lies 400 yards northwestward of it.

A shoal, with a depth of $2\frac{1}{4}$ fathoms, lies on the northern side of the eastern entrance, with Klubben Beacon bearing 242° , distant 1 mile. It is marked by a red spar buoy surmounted by a broom; about 250 yards southward is a black and white spar buoy, with another lying about 400 yards west-southwestward of it, marking shoals on the southern side of the entrance.

There are numerous other shoals, some of which are marked.

Lights—Grimskallen Front Light, situated on the mainland, on the northern shore of the bay about $\frac{3}{4}$ mile eastward of the town, is an occulting white light with red sector, exhibited at an elevation of 34 feet above the sea from a white tower; the white light is visible 9 miles and the red light 7 miles. (For details, see Light List.)

Rear light: About 400 yards 322° from the above light a fixed red light is exhibited at an elevation of 65 feet above the sea from a white tower and is visible 9 miles. (For sector, see Light List.)

These two lights in line, bearing 322° , lead through the southern channel into Oskarshamn.

Ovadersudden (Ovädersudden) Light is an occulting white light, with red and green sectors, elevated 11 feet above the sea.

The light is shown from a small tower on the southern shore of the bay about $\frac{1}{2}$ mile eastward of the town. (For details, see Light List.)

Oskarshamn Range Lights, fixed red, 26 feet and 36 feet above the sea, respectively, kept in line bearing 287° , lead from Ovadersudden Light to the pier. The front light is on the southwestern point of Baholmen, the rear light on the quay and 120 yards from the former.

Anchorage.—In the road the depth is 6 to 7 fathoms, and in the anchorage north of Klubben Beacon, $7\frac{1}{2}$ to 10 fathoms, mud, clay, and rock. In the anchorage eastward of Grimskallen South Light the depths are from $5\frac{1}{2}$ to 10 fathoms.

Pilots.—Oskarshamn is a pilot station; pilots attend at Furön and meet approaching vessels either off that island or outside the outer shoals. In winter they attend at Ernemara. Vessels from the southward can obtain a pilot at Vällö.

There is a decked motorboat at Oskarshamn Pilot Station.

Directions.—The channels leading to Oskarshamn from the entrance of the bay are narrow and intricate; strangers must employ a pilot to enter the harbor, and are recommended to do so for the entrance channels.

Southern entrance.—Vessels of suitable draft, when approaching from the southward, can use this channel, which lies within $\frac{1}{4}$ mile of the shore. When $4\frac{1}{2}$ miles distant bring Grimskallen Light-houses or Lights in line, bearing 322° , and steer for them, leaving a black and white spar buoy with ball outside Stangöhamn to port and a shoal awash, marked on the southwestern side by a red broom buoy, and on the eastern side by a black and white spar buoy to starboard. After passing Algardskär Beacon on the port hand, three red broom buoys lie on the starboard side, marking Lars Olsons Grund, awash, and farther in a black and white spar buoy is left to port; outside this buoy is the shoalest part of the channel, 13 feet. When about 400 yards from Klubben Beacon turn a little to port and pass between a black and white spar buoy marking the shoal water outside Klubben, and a red spar buoy with broom marking a shoal of 1 fathom about 200 yards northeastward; then round Klubben 300 yards distant and anchor northward of it in 8 to 10 fathoms or proceed with a pilot into the harbor.

Southeastern entrance.—Vessels from the southward, by keeping Röds-kär midway between the eastern side of Runö and the western side of Tacktö, can reach the red buoy with upturned broom over ball on the southwestern end of Flatbottens Grund, whence a 324° course will lead westward of that shoal, and toward a black spar buoy with ball lying about $1\frac{1}{4}$ miles 95° from Klubben Beacon; leave

this buoy to port and wait for a pilot. In this channel there are several unmarked shoals of $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms.

At night, from the southward, the junction of the fixed white and flashing white sectors of Dämman Light astern, bearing 160° , passes a little westward of the southern buoy of Flatbottens Grund, whence a course should be shaped to pass eastward of the black spar buoy with ball mentioned in the preceding paragraph. Before reaching the black buoy the sector of occulting red light from Grimskallen will be entered, bearing 293° , and by continuing on the same course the narrow occulting white sector of that light is entered, and at about the same time Ovadersudden occulting red light will be seen, bearing 249° ; then turn to port and steer for Grimskallen Light, keeping in the white sector between 271° and 273° for a little over $\frac{1}{2}$ mile, and when the sector of occulting white light from Ovadersudden is entered steer toward it between the bearings of 232° and 236° ; in this sector is an unmarked shoal of $3\frac{1}{2}$ fathoms. About 200 yards from Ovadersudden Light the leading lights of Oskarshamn come in line 287° , which lead into the harbor, passing over a depth of 16 feet.

Eastern entrance.—To approach the eastern entrance passing south of Furön, when 2 miles from that island steer 272° toward Grimskallen Southern Lighthouse, and when Furön Lighthouse bears about 37° wait for a pilot, or continue on the above course, which leads northward of Flatbottens Grund; a shoal of 3 fathoms lies northward of the black spar buoy with ball, on that grund, which should be avoided by passing between it and the buoy, when continue the course until Ovadersudden Lighthouse bears 234° , when steer for it and anchor northward of Klubben Beacon.

At night steer 272° toward Grimskallen South Light, keeping in the narrow occulting white sector, which leads southward of the shoals off Furön, but on the northern edge of the sector, southeastward of Furön, is a patch of $3\frac{1}{2}$ fathoms. Northward of Flatbottens Grund is a patch of 3 fathoms, which can not be avoided at night. When the occulting white sector of Ovadersudden Light is entered follow the directions previously given for the southeastern entrance.

The channel north of Furön should not be taken without a pilot or local knowledge, as no leading marks are available, and the course must be directed by the buoys.

Oskarshamn is a town of about 8,000 inhabitants and an important place of trade. The church has a square white tower, with high, pointed, black spire.

The harbor is tolerably well sheltered and has depths of from 18 to 29 feet at mean water level, over mud and clay. The quay along the southern shore is about 600 yards long, with depths along-

side ranging from 9½ to 21 feet; on the northern side is a quay, 328 yards long, with from 11 to 21 feet alongside. There is an 8-ton crane at the harbor.

Ice obstruction occurs in the latter part of January and during February and March, but navigation is seldom closed, and in 1910 was quite free for steamers.

Coal can be obtained at Oskarshamn. About 4,000 tons are imported annually, and 800 tons kept in stock. There is no private coal wharf. Vessels coal in harbor, either at anchor or alongside the quay.

Supplies.—Provisions can be obtained, but meat is not plentiful. Water is brought alongside in a small water-boat, price \$1.25 per ton.

Dock.—See Appendix I.

Repairs.—Large repairs can be executed to hull and machinery by the Oskarshamns Mekaniska Verkstads och Skeppsdockas Aktiebolag, which has a shipbuilding and repairing yard and owns the dry dock; there is a crane which will lift 40 tons. A vessel of 2,000 tons burthen has been built here.

Communication.—There is a telegraph station and railway communication. There is also steam communication with places on the east and west coasts of Sweden.

Tugs are available.

Trade.—The principal exports are wood goods, paper, pulp, and granite, and imports coal and coke, machinery, oats, manure, and oils.

Oskarshamn—Harbor regulations.—The vessel's arrival must be reported to the harbor master as soon as the customs examination is completed and pratique given. The vessel must be moored in the position allotted by the harbor master, and mooring cables must be adjusted or changed as required by him.

Engines must not be moved when secured to the piers; the distance off the quay at which they may be moved will be regulated by the harbor master.

Steam whistles may not be used except as necessary for maneuvering.

When moored alongside the pier, yards must be topped and jibboom rigged in, anchors hoisted inboard, and fenders provided.

Hawsers and cables must not be secured to the pier, but to the securings provided.

For further regulations and details, see the pamphlet published by the harbor authorities.

Furön (Furö), situated 5½ miles eastward of Oskarshamn, is a small, low island, almost bare, surrounded by reefs on which the sea breaks; from the eastern side of the island the reef named Örbådan projects about ½ mile, and is marked on its eastern side by a black and white spar buoy with ball; the reefs on the southeastern and

southern sides, named Finn and Blackbåd, are marked by one and two broom buoys, respectively, and outside them, about $\frac{1}{2}$ mile south-eastward of the island, are patches of $3\frac{1}{2}$ and $4\frac{1}{4}$ fathoms, and one of $4\frac{3}{4}$ fathoms $\frac{1}{2}$ mile to the southward; between the northwestern side of Furön and the mainland there are numerous shoals with deep water between. Small vessels of about 6 feet draft may enter a small creek on the southwest side of Furön.

Light.—From a red tower on the pilots' dwelling on Furön (Furö), a flashing white light with red sector is exhibited at an elevation of 47 feet above the sea. The red light is visible 8 miles and the white light 12 miles. (For details, see Light List.)

Pilots.—The Oskarshamn pilots attend on Furön, except in winter, when they are at Ernemara. When pilots are obtainable a black ball with horizontal white band will be hoisted on a mast on the east gable of the pilots' dwelling.

The coast between Oskarshamn and Kråkelund, 13 miles north-eastward of it, is wooded and of uniform height; the off-lying islands are low, and so close to each other that they can only be distinguished when near; there are numerous shoals and reefs in this part, some of which extend 3 miles from the shore.

Lilla Saltvik, Stora Saltvik, and Virbo are three small ports situated midway between Oskarshamn and Figeholm.

Figeholm Harbor lies at the head of a bay about 7 miles north-eastward of Oskarshamn, and has a depth of $11\frac{1}{4}$ feet. Vessels of $10\frac{3}{4}$ feet draft at mean level, and 1 foot less at low level, can enter. There is ice obstruction generally from December to April.

Anchorage.—Outside the harbor the depth increases, and $\frac{1}{2}$ mile distant there are $3\frac{3}{4}$ fathoms; and northward of Foglö, in the middle of the bay, anchorage may be obtained in a depth of 5 to 9 fathoms, clay. Vessels of 18 feet draft can reach the anchorage at mean level, and $1\frac{3}{4}$ feet less at low level.

Landmarks.—The entrance to Figeholm is marked by a pole beacon on Homeskär, on the western side of the channel; the beacon, which is 24 feet high, is surmounted by a triangular board, and the lower parts of the stays are covered with white boards.

On the northern shore of the bay is Hägnekubben Beacon or cairn, with pole and narrow horizontal rectangular board on top.

A pilot shelter, with a white gable facing seaward, on which the word **Lots** (pilots) is painted in black letters, stands on Foglö, and kept in line with Homeskär Beacon leads in the channel to Homeskär.

Pilots.—Figeholm is a pilot station; pilots attend on Foglö, and meet vessels at South Blackor Shoal. They can not be obtained at night.

Directions.—To enter, bring Foglö Pilot Shelter in line with Homeskär Beacon, 323° , which mark leads in between the shoals; $1\frac{1}{2}$ miles from the beacon a red spar buoy with upturned broom over ball is left to starboard, and farther on on the same side are two red broom buoys marking the western end of South Blackor Shoal, with 3 feet on it. A stranger should not proceed inside South Blackor without a pilot. Farther in the channel passes eastward of Homeskär and then becomes narrow and tortuous, but is marked by red broom buoys to starboard and black and white spar buoys to port.

Figeholm.—At this place there are two small loading piers, and a quay 82 feet long, with $8\frac{3}{4}$ feet alongside.

Provisions and water can be obtained, and wooden vessels can be repaired.

There is steam communication with Oskarshamn and places in Kalmar Sund; there is a telegraph office.

Uthammar, on the northeastern shore of Figeholm Bay, over 2 miles eastward of Figeholm and 600 yards from Hägneskubben Beacon, has a small quay with a depth of 12 feet alongside, where granite is loaded. The channel to Uthammar is marked by beacons.

Outer Rönne Reef, with $1\frac{3}{4}$ fathoms water, and depths of $3\frac{1}{2}$ to 9 fathoms close around, lies $5\frac{1}{4}$ miles northeastward of Furön and $2\frac{1}{2}$ miles offshore.

Buoy.—A black and white spar buoy, with two balls, is moored in $3\frac{3}{4}$ fathoms, on the eastern edge of this reef. About 600 yards east-southeastward of the reef is a shoal of $3\frac{3}{4}$ fathoms.

Clearing marks.—Oskarshamn Church, well open southward of the wooded point on Lindö, which appears as the outer extreme of the mainland, leads southeastward, and Kråkelund Beacon, open eastward of Stubbskär Beacon, leads eastward.

Offlying bank.—About $4\frac{1}{2}$ miles east-northeastward from Furön is a bank $2\frac{3}{4}$ miles in length north-northwest and south-southeast within the 10-fathom curve and about 1,200 yards broad, with deeper water around. The general depths on the bank are from 6 to 10 fathoms, stones, and there are three shoal spots, one of $4\frac{1}{4}$ fathoms at the southern end, $3\frac{1}{4}$ fathoms near the center, and 5 fathoms toward the northern end. From the shoalest spot Jungfrun Island bears 168° distant $3\frac{3}{4}$ miles.

Eastern shore of Kalmar Sound—Öland is 74 miles long north-northeast and south-southwest, and from 2 to $8\frac{1}{2}$ miles across. The population of the island at the end of the year 1909 was about 27,300. Agriculture, cattle and horse breeding, and eel fishing are the principal occupations. Cement and limestone are important industries. Trade is conducted principally through the mainland, except that of Degerhamn.

West coast.—From a short distance northward of Ölands South Point, which is low and treeless except for Ottenby Wood, a barren hilly range extends in a northerly direction along the western side of the island. Between Ölands South Point and Degerhamn $9\frac{1}{2}$ miles northward of it the coast is low, with numerous houses on it; at Degerhamn the range approaches within a short distance of the coast, receding again northward of that place, whence to abreast Thorslunda, 17 miles northward, the coast has the same appearance as that southward of Degerhamn. The range continues as far as Borgholm, and has several windmills on it; its highest elevation is 195 feet.

Ölands South Point—Light.—On Ölands South Point stands a circular white stone tower with red band 137 feet in height, from which at an elevation of 134 feet above the sea a group flashing white light is exhibited, visible 18 miles.

An auxiliary white light is exhibited from the same tower at an elevation of 125 feet above high water; it shows occulting over Utgrunden, fixed between Utgrunden and Gåsstens Grund, obscured elsewhere. The light is visible 18 miles. (For details see Light List.)

Fog signal.—During thick and foggy weather a fog explosive signal is made.

Ice and light vessel signals.—A black cone, point upward, shown from the southeastern side of the lighthouse balcony, indicates that the Almagrundet Light Vessel is not on her station.

A black ball, shown from the western side of the lighthouse balcony, indicates that the northern part of Kalmar Sound is closed by ice.

Ölands Reef extends in a southerly direction from Ölands South Point, and at a distance of $2\frac{1}{4}$ miles south-southwestward from the lighthouse there is a depth of 15 feet on the reef; it also extends $2\frac{1}{4}$ miles in an easterly direction from the point. The southwestern and western sides of this reef are steep-to and can not be approached by the lead, but the eastern side shoals gradually. There is a depth of $4\frac{3}{4}$ fathoms $4\frac{1}{2}$ miles 180° from the lighthouse, and 10 fathoms 6 miles in the same direction.

Buoys.—A red spar buoy with two balls under an upturned broom is moored in a depth of $3\frac{3}{4}$ fathoms near the southern extremity of Ölands Reef, and two other red broom buoys mark the western edge between it and the point.

Shoal.—A steamer drawing 22 feet is reported (1916) to have struck bottom about 1 mile south-southeastward of the spar buoy with broom and two balls marking the southern end of Ölands Reef.

A red spar buoy, with ball and broom over it, marks Hamngrund, the eastern extremity of Ölands Reef.

Light and whistle buoy.—About 6 miles southward from Ölands South Point a red light and whistle buoy, exhibiting a *flashing white* light every 5 seconds, marks the extremity of the shoal extending to the southward from the point.

It was intended (1915) to replace the light and whistle buoy by a light vessel.

Landmarks.—On the southern part of the west coast of Öland are several churches, the most conspicuous of which are Ventlinge, Södra Möckleby, Smeby, Kastlösa, Mörbylånga, Resmo, and Thorslunda (Torslunda); the high chimney at Alunbruk, southward of Degerhamn, and the towns of Degerhamn and Mörbylånga are good landmarks. At Mörbylånga is a sugar factory with a high chimney.

Life-saving.—A lifeboat is stationed at Grönhögen, 4 miles northward of Ölands South Point.

Degerhamn.—Degerhamn, $9\frac{1}{2}$ miles northward of the south end of Öland, has a harbor formed by two moles, one of which is about 848 yards long, curving toward the south, and the other about 218 yards long in a northwestern direction, the entrance between the moleheads being 60 yards wide.

The southwestern part of the harbor has a depth of $11\frac{1}{4}$ feet at mean level, bottom of rock and clay, and vessels of $10\frac{1}{2}$ feet draft can enter. There are three loading piers, with from $5\frac{1}{2}$ to $11\frac{1}{4}$ feet alongside. At low level the depths are 2 feet less. The north part of the harbor is shoal. In the road outside there is anchorage in $4\frac{1}{4}$ fathoms, but vessels must be prepared to put to sea with winds from the western semicircle.

Södra Möckleby Church, just northeastward of the town, is conspicuous.

Buoys.—When entering the harbor a red spar buoy with up-turned broom over a ball and a broom buoy are left to port, and a black and white spar buoy to starboard.

Range lights.—Two fixed green electric lights, the rear light elevated 30 and the front light 21 feet above the sea, are exhibited from posts at Degerhamn Harbor. The lights are 71 yards apart and in line bear 22° ; the rear light is an arc lamp and the front light is incandescent.

The rear post carries a white triangle, point down, and the front post a white triangle, point up.

Pilots.—Degerhamn is a pilot station; pilots meet vessels outside the harbor except at night.

Trade.—Lime, cement, grain, and sugar beets are exported, and the imports are coal, coke, wood, clay, and bricks. There is a customs station.

Water and a small quantity of provisions may be had.

Communication is kept up with Kalmar and other places in Kalmar Sound by steamers.

Gåsstensgrund, a shoal of $1\frac{1}{4}$ fathoms, lies 2 miles northward of Degerhamn and $\frac{3}{4}$ mile offshore; depths under 5 fathoms extend $\frac{3}{4}$ mile westward from the shoal.

Buoy.—A red spar buoy, with ball under a down-turned broom, marks the western side of Gåsstensgrund.

Eckels Point—Buoy.—A spar buoy with up-turned broom lies $1\frac{1}{4}$ miles 198° from Eckels Point and the same distance from the shore to the eastward, to mark the edge of the shore reef, with 1 fathom on it. Smeby Church stands about 2 miles southeastward of Eckels Point.

Mörbylånga, $6\frac{1}{4}$ miles northward of Eckels Point, has a small harbor which is being enlarged and deepened; the western part of the inner harbor has a depth of $9\frac{3}{4}$ feet, and the eastern part from $2\frac{1}{4}$ to $4\frac{1}{2}$ feet. North-northeastward of the harbor a curved breakwater about 120 yards long extends from the shore, and the preexistent mole has been extended by a curved pier 49 yards long. The entrance between the heads of the breakwater and pier is 46 yards wide. At about 20 yards south of the breakwater is a loading pier about 55 yards long, with a depth of $11\frac{3}{4}$ feet on its south side. The outer part of the harbor is being dredged to a depth of $11\frac{3}{4}$ feet at mean level.

A quay, 112 feet long, has the same depth alongside as in the harbor. At low level the depth is $1\frac{1}{2}$ feet less. In the road northward of the harbor the depth is about 10 feet, sand. Water can be had. Communication as at Degerhamn. Pilots are obtained from Kalmar.

Buoys—Beacon.—The entrance channel leads between a red spar buoy with upturned broom over a ball on the northern side and a black and white spar buoy on the southern, after which it turns southward to the harbor.

About $\frac{3}{4}$ mile northeastward of the harbor is a pole beacon with stays, and on top a black triangular board, point upward. Resmo Church and the beacon in line, bearing 82° , lead between the above buoys.

The dredged channel leading to the harbor is about 262 yards long, with a depth of $11\frac{3}{4}$ feet at mean water level, and is marked by two red broom buoys on the eastern side and two black and white spar buoys on the western.

Range lights.—Two fixed red range lights at Mörbylånga lead from Kalmar Sound through the outer entrance channel to the entrance of the dredged channel. The front light is 11 feet and the rear light 29 feet above the sea, and are shown from posts 372 yards apart, in line bearing 81° . The front light post is surmounted

by a white triangular daymark, point upward, and the rear light post by a similar mark, point downward.

Two fixed green range lights lead through the dredged channel: the front light, elevated 18 feet above the sea, is shown from an iron structure on the northern harbor molehead, and the rear light, elevated 26 feet, from a post on the quay within. The lights are 142 yards apart, and in line bear 127° .

The above lights are shown from July 6 to June 6.

Möln Grund, about 1 mile northward of Mörbylånga, extends more than a mile offshore and has a reef near its western edge. The southern part is marked by the northern entrance buoy of Mörbylånga.

Kaholmen.—Between Degerhamn and Kaholmen, $15\frac{1}{2}$ miles northward of it, foul ground extends 1 to $1\frac{1}{2}$ miles from the shore. Near Kaholmen, on the outer edge of a reef $1\frac{1}{2}$ miles broad, there are several small, low islands, the northernmost and largest of which is named Svansholm; nearly 1 mile southward of this island lies Ytterskär, joined to Öland by a stone dam. Between the islands there is a boat harbor named Beijershamn. Northward of Kaholmen numerous rocks and shoals extend across the sound to Kalmar.

Färjestaden—Beacons.—About 700 yards southward of Färjestaden Harbor are two pole beacons with stays, about 600 yards apart, in line bearing 113° . The outer beacon on the shore has as topmarks a white square over a black diamond, and below the upper parts of the stays a square board, the upper half of which is white and the lower black.

The inner beacon has a black ball over a white square as topmark.

Thorslunda (Torslunda) Church, with a square tower surmounted by a cupola, lies about 2 miles southeastward from Färjestaden.

Harbor.—Färjestaden, situated nearly opposite Kalmar, has a small harbor formed by two moles, the northern of which extends west-southwestward 191 yards and the southern curves in a north-west direction for 109 yards, the entrance between the moleheads being 33 yards wide. In the practicable part of the harbor, from the entrance to the quay, which is 124 feet long, the depth is 12 feet, and 1 foot less at low-water level. Water can be obtained. Pilots are obtained from Kalmar.

Lights.—Two fixed white range lights, elevated 10 and 23 feet, respectively, 600 yards apart, and in line bearing 113° , are shown when mail steamers arrive and leave.

Communication.—There is a telegraph office; daily steam communication is kept up with Kalmar and other places in Kalmar Sound; in winter postal communication is maintained with Kalmar by steamer.

Directions.—The two beacons southward of the harbor in line 113° lead between the shoals lying nearest Öland to a red spar buoy with upturned broom over ball situated at the entrance of the channel leading to the harbor. This buoy is left to port and the molehead then steered for until two red broom buoys have been passed on the port hand, after which the channel winds between a red broom buoy to port and two black and white spar buoys to starboard to the harbor entrance.

Shoals.—Kalmar Sound, abreast Färjestaden, and for about $1\frac{1}{2}$ miles northward, is almost completely blocked by shoals, many of which are awash. A dredged channel leads through them on the western side past Kalmar. A buoyed channel, with a depth of $19\frac{1}{2}$ feet, also leads from Färjestaden to Kalmar.

About $2\frac{1}{2}$ miles northward of Färjestaden foul ground extends nearly $1\frac{1}{2}$ miles from the Öland shore, ending in a shoal named Bredgrund, and about 1,400 yards northward of the extremity of the latter shoal the edge of the shoal is marked by a red spar buoy with upturned broom; thence to Ispe Point the width of the foul ground decreases.

About $\frac{1}{2}$ mile southwestward of Ispe Point is a shoal of 2 fathoms, with $3\frac{1}{4}$ fathoms outside it; a red spar buoy with broom is moored in $3\frac{1}{4}$ fathoms on the northwestern side of the shoal, which extends into the white sector of Ispe Point Light; caution is therefore necessary at night.

Ispe Point lies $5\frac{3}{4}$ miles north-northeastward of Färjestaden, and nearly abreast Skägganäs. The point is fairly steep-to, the 5-fathoms line being about 300 yards off it.

Light.—From a reinforced concrete tower 25 feet high on Ispe Point a group flashing white light, with red and green sectors, is exhibited at an elevation of 24 feet above the sea; the white light is visible 10, the red 8, and the green 7 miles. (For details see Light List.)

Stora Rör, a village 1,700 yards north-northeastward of Ispe Point, has a harbor formed by two moles, the southern of which is 186 yards long in a west-northwest direction and the northern about 109 yards long south-southwest. The outer part of the southern mole bends northward, leaving an entrance between the moleheads 33 yards wide. The depth in the practicable part of the harbor is $10\frac{1}{2}$ feet at mean water level and $8\frac{3}{4}$ feet at low level. A loading pier and a quay, 31 and 69 yards long, respectively, have the same depth alongside as in the harbor. Vessels of $9\frac{1}{2}$ feet draft can enter at mean level. Water can be obtained and a few provisions. The Kalmar Sound steamers call. Pilots are obtained from Skägganäs. There is a telegraph office.

Beacons.—About 600 yards northeastward of Stora Rör are two beacons which indicate the direction of the telegraph cable across the sound to Skägganäs.

Shoals.—Shoal water extends 600 yards northward from Stora Rör, with a depth of $1\frac{1}{2}$ fathoms at the outer end; the northwestern edge of this shoal is 800 yards from the shore on the line of the telegraph beacons.

About 1 mile northward of Stora Rör is a shoal with $1\frac{1}{2}$ fathoms least water, the outer edge of which lies about $\frac{1}{2}$ mile from the shore. From the shoalest spot Högstrum Church bears 106° .

Ekerums Reef.—Near the village of Ekerums, $3\frac{1}{2}$ miles northeastward of Ispe Point, there is a small spit, from which a reef with 6 feet water extends about 1,300 yards in a northerly direction. A red spar buoy with broom is moored in a depth of $3\frac{3}{4}$ fathoms, close to the northwestern edge of this reef and $\frac{1}{2}$ mile from the shore.

Clearing marks.—The white house at Röhälla, about 2 miles southward of Ispe Point in line with the lighthouse on that point, or Kalmar Slott just westward of the cathedral, leads westward. The northern white sector of Ispe Point Light in sight also leads westward of Ekerums Reef and the shoals between it and Stora Rör.

Ekerums Hamn, southeastward of the reef just mentioned, has a depth of $11\frac{1}{4}$ feet at mean level, over mud and sand, but is seldom used, and is open to northerly winds. There is a small jetty with $6\frac{1}{2}$ feet alongside.

Greby Grund, with a depth of $2\frac{3}{4}$ fathoms, lies about halfway between Ispe Point and Borgholm, 1 mile from the shore.

Buoy.—A red spar buoy, with down-turned broom over a ball, marks the western side of Greby Grund.

Clearing marks.—Greby Grund is covered by a sector of red light from Ispe Point, and the white sector of that light in sight leads westward. Ispe Point Lighthouse bearing nothing westward of 190° by day leads westward.

Borgholm—Landmarks.—Borgholm Slott, a ruin standing on a steep rock, among trees, $\frac{1}{2}$ mile southward of the harbor, is very conspicuous and may be seen from a distance of 20 miles when approaching from the northward, and also over the island in an east-northeast direction for 12 to 16 miles seaward.

Kung Karls Sten is a monument, situated northward of the castle. Borgholm Church is high and white, with a black, pointed spire.

Dangers—Buoys—Sollidsgrund, with $2\frac{3}{4}$ fathoms, lies about $1\frac{1}{4}$ miles 258° from Krak Point Lighthouse, and is marked on its western side by a red spar buoy with a ball between two down-turned brooms. A patch of $2\frac{1}{4}$ fathoms lies a short distance northeastward and another of $2\frac{3}{4}$ fathoms between it and the shore.

Clearing marks.—Ispe Point Lighthouse bearing nothing westward of 197° , leads westward, and at night Skägganäs white light or Ispe Point Light in sight leads westward also.

Borgholm Church open southward of the Government store half the length of the store, or in line with the northern side of the new bath hotel, leads northward of these shoals.

Rörkallen, a shoal with 5 feet on it lying about 700 yards northward of the harbor entrance, is marked on its southwestern side by a red spar buoy, with down-turned broom over ball.

Bergqvists Grund, a rocky patch of $1\frac{3}{4}$ fathoms, lies 300 yards southwestward of Rörkallen, and is marked by a red spar buoy with upturned broom on its southwestern edge and on the northeastern side by a black and white spar buoy.

Krak Point Reef, with 4 feet on it, lies outside the harbor, on the southern side of the channel, and is marked on its northern side by a black spar buoy with ball.

Hamngrund, on which the sea breaks, lies outside the entrance, and is marked on the southern side by a red spar buoy with broom and on the northern side by a black and white spar buoy.

Lights.—On Krak Point, southern side of the entrance to Borgholm Harbor, from a white octagonal tower, an unwatched occulting white light is exhibited, at an elevation of 17 feet above the sea, visible 7 miles. (For details see Light List.)

Two fixed red range lights are shown in the bathhouse grounds and on the outer end of the wooden quay from lanterns on wooden frameworks, elevated 34 and 21 feet, respectively, above the sea; each framework is surmounted by a white circular disc with a vertical black band in the middle. The lights are 525 feet apart.

Two fixed green range lights, 95 feet apart, are shown at the northeastern part of the harbor, at the respective heights of 20 feet and 26 feet above the sea; the wooden framework supports of these lights have square white boards with black borders to serve as day marks. In line these lights lead clear of Hamngrund into the harbor and up to the red mooring buoy there.

Pilots.—Borgholm is a pilot station; pilots meet vessels outside the shoals except at night.

Anchorage.—In favorable weather vessels can anchor inside Rörkallen in from 16 to 26 feet, sand, or outside that shoal in from $3\frac{3}{4}$ to 6 fathoms; also with Krak Point Lighthouse in line with the center of the ruined castle, bearing 132° , 1,400 yards, from the shore, in about 8 fathoms; a black and white spar buoy marks the edge of the shore reef on about this line.

Harbor.—Borgholm has a well-sheltered harbor, formed by a mole extending 246 yards in a southwesterly direction; the molehead

is white. The least depth in the practicable part of the harbor is $11\frac{1}{4}$ feet and 1 foot less at low level. At the outer quay, 426 feet in length, the depth is 16 feet. Vessels of $11\frac{1}{4}$ feet draft can enter the harbor. Ice obstruction occurs usually from the middle of December to the middle of April. There is a large mooring buoy in the harbor, at which vessels drawing 10 feet can swing.

Directions.—When about 1 mile from the entrance bring the two red lights, or their supports, in line, 101° , which lead between the black buoy with ball on Kråk Point Reef to starboard, and the red broom buoy on Hamngrund to port; near the latter the green light supports or lights come in line, bearing 68° , which mark leads to the booring buoy, leaving a black and white spar buoy near the entrance to starboard.

Town.—Borgholm on the west coast of Öland, about 16 miles northeastward of Kalmar, has about 1,000 inhabitants. Provisions can be procured, but no coal. Grain is exported.

Communication takes place by steamer with Stockholm and ports on the east and west coasts of Sweden, besides the places in Kalmar Sound. There is a telegraph office.

The coast from Borgholm trends in an easterly direction $2\frac{1}{2}$ miles to Köping Village, thence in a northerly direction, forming a bay in which there are several shoals; from Köping to Horn Point the coast is steep and light colored; on the hilly ridge are several groves of trees, and the churches of Köping, Alböke, and Föra are seen. Northward of Horn Point to the north end of the island the coast is steep and generally wooded.

Landmarks.—The most conspicuous objects on the northwest coast of Öland are Borgholm Castle Ruin; Köping Church, white with square tower surmounted by a cupola; Alböke Church; a mill on the northern side of Sandviken; Horn Point Lighthouse; and the lighthouse on Öland North Point.

Dangers.—The following shoals are the outermost on the Öland side of Kalmar Sound between Borgholm and Horn Point:

Bruns Grund, with $3\frac{3}{4}$ fathoms on it, lies about 2 miles northward of Borgholm and about the same distance from the shore to the eastward.

Elefanten—Buoy.—Elefanten, with 2 fathoms of water, lies 3 miles northward of Borgholm and $2\frac{1}{2}$ miles from the shore. Near its western edge is moored a red spar buoy with ball, surmounted by a down-turned broom.

Clearing marks.—Kung Karls Sten in line with the Government storehouse at Borgholm or the white molehead at that place under the west side of the ruined castle, leads westward, and the highest woody grove on Pata Enskär, under the end of a wood on the

mainland, bearing 249° , or Patslan Beacon, eastward of a wooded hill, 242° , leads northwestward of Elefanten.

Marsgårdskulan—Buoy.—Marsgårdskulan, a rocky shoal, with 5 feet water and a depth of 5 to 6 fathoms close around, lies $4\frac{1}{2}$ miles northward of Köping Church and nearly $1\frac{1}{2}$ miles from the shore. From the center of the shoal Alböke Church bears 92° . A red spar buoy with ball under a down-turned broom is moored on the north-western edge of the shoal.

Clearing mark.—The Government storehouse at Borgholm touching the western side of the ruined castle, leads westward of Marsgårdskulan.

Lars Persons Grund—Buoy.—Lars Persons Grund, with $2\frac{1}{2}$ fathoms of water and depths of 6 to 9 fathoms close around, lies $3\frac{1}{2}$ miles northward of Marsgårdskulan and 3 miles from the Öland shore. On the western side of this grund there is a red spar buoy with two balls surmounted by a down-turned broom. About $1\frac{1}{2}$ miles 150° from Lars Persons Grund and nearly $1\frac{1}{2}$ miles offshore lies a shoal named Oxle Grund, with $3\frac{1}{2}$ fathoms and deep water close around.

Clearing marks.—Borgholm Castle Ruin open half its breadth eastward of the western storehouse at Borgholm, or Kung Karls Sten its own height westward of the Government store, or the two storehouses with red-tiled roofs at Borgholm Pier, under the center of the castle ruin, leads westward of the shoal. Vessels on a northerly or southerly course will be abreast the shoal when Mönsterås Church is a little open southward of the customs lookout on Biörnö and right over a house with red-tiled roof.

All the above shoals are covered by the sector of fixed green light from Dänman, and the fixed white sector of that light leads westward of them.

Sandviken, 13 miles northward of Borgholm has a harbor formed by two curved moles, the northern 153 and the southern 191 yards long, the entrance between them being about 35 yards wide. The harbor is somewhat silted up at present, but the depth will be 8 $\frac{1}{2}$ feet at mean level, with the same depth alongside the quay. There is a crane to lift one ton.

In gales from west to northeast through north, vessels do not lie securely, as the sea breaks over the north mole. Provisions and water can be procured. There is steam communication with ports in Kalmar Sound. There are no pilots but assistance in piloting can be obtained from the harbor.

Sandviken—Lights.—Two fixed red lights, 135 yards apart, are shown at elevations of 20 and 34 feet above the sea from posts with white topmarks at Sandviken from March 15 to April 14, and from August 25 to December 20; in line 80° , they lead into the harbor.

Horn Point Light, situated 21 miles north-northeastward from Borgholm, is an occulting white light, shown from a white cylindrical iron structure, at an elevation of 33 feet above the sea and is visible 8 miles. (For details, see *Light List*.)

Jungfrun is a precipitous and conical-shaped island 292 feet high, situated about 10 miles within the northern entrance of Kalmar Sound and about midway between Öland and the mainland. In clear weather it forms the best landmark in the approach to Kalmar Sound from the northward or northeastward, being visible in clear weather from 20 to 24 miles. It is densely wooded to the summit, on which is a small beacon.

Mirage alters the shape of the island completely; sometimes it appears flattened, broad, and low; at other times pointed. In the latter case, if fog and clouds also gather round the summit, bad weather is said to be approaching. The coast of Jungfrun is high and steep except on the southeastern side where shoal water extends off 100 yards. Vessels should not anchor within $\frac{1}{4}$ mile of the island on account of numerous blocks of stone on the bottom. Landing is difficult with any sea or swell. On the northeastern side of the island there is a spring with good fresh water.

Byerums Grund and Enerums Grund.—Byerums Grund, with $5\frac{1}{4}$ fathoms least water, is of small extent, and lies 3 miles north-eastward from Jungfrun Island, and $2\frac{1}{2}$ miles from the shore. Enerums Grund, with $5\frac{1}{2}$ fathoms least water and depths of 15 to 20 fathoms close around, lies $4\frac{1}{2}$ miles northeastward from Jungfrun; it is 1 mile in extent northwest and southeast and about $\frac{3}{4}$ mile broad. There is a heavy swell on these grounds during gales from north to northeast.

Byxelkroken is a small bay situated on the western side of Öland about 3 miles from its northern extremity, and is protected from westerly winds by a bank, parts of which are awash, having inside it anchorage in a depth of 3 fathoms, sand and clay. Vessels of 17 feet draft can enter by the northern entrance. North and northwest winds send a sea into the harbor, and at such times vessels of $9\frac{1}{2}$ feet draft can leave by a channel southward of the bank. There is a jetty 56 yards long, with $10\frac{3}{4}$ feet alongside. The depths given are at mean water level; at low level there are $1\frac{1}{2}$ feet less.

Buoys.—The northern entrance is marked on its northern side by a red spar buoy with upturned broom, and on the southern side by a black and white spar buoy.

The leading mark for the northern entrance is a large, white square board on a high oak tree in line with a stone beacon.

There is steam communication with Stockholm, Norrköping, and places in Kalmar Sound. Water and a small quantity of provisions

can be obtained. Wood goods, stone, farm produce, and cattle are exported. There are no pilots.

Light.—At Tokenäs Point, on the southern side of Byxelkroken, from a white cylindrical iron structure on a gray square stone base, an occulting white light is exhibited at an elevation of 23 feet above the sea, visible 6 miles. (For details, see Light List.)

Torrboggrund, with $4\frac{3}{4}$ fathoms over it, and a depth of 15 fathoms close around, lies $1\frac{1}{4}$ miles northward of Byxelkroken Bay, and $\frac{3}{4}$ mile from the shore.

Holme Reef with 18 feet upon it, and 10 fathoms close to its northern and western sides, extends about $\frac{1}{4}$ mile from the shore on the western side of the northern extremity of Öland.

Buoy.—On the edge of the shore reef, about 1 mile eastward of Holme Reef, a black spar buoy with ball is moored in a depth of 23 feet.

Öland North Point Light.—On a rock named Storgrund or Axeholm (Axelholm, or, properly, Oxelholm), near the northern extremity of Öland, stands a white circular stone tower, 107 feet high, from which, at an elevation of 103 feet above the sea, is exhibited a group white flashing light, visible 16 miles. (For details, See Light List.)

Fog signal.—Near the lighthouse on Öland North Point, a siren, worked by compressed air, is sounded.

Ice signal.—A black ball, shown from the northwestern side of the lighthouse balcony, indicates that the northern part of Kalmar Sound is closed by ice.

Anchorage.—In fine weather or southerly winds vessels can anchor on the bank northeastward of Öland North Point Lighthouse, in 9 or 10 fathoms clay, with the lighthouse bearing 232° , distant 1 mile, and the eastern extremity of the land to the southward 169° . Small vessels can anchor closer in in $3\frac{1}{2}$ fathoms, sand and rock.

Bjornabben Life-saving station.—A life-saving station, with rocket apparatus, is located at Bjornabben, 1 mile west from Öland North Point Lighthouse.

Gryt Grund, with a least depth of $3\frac{3}{4}$ fathoms over it, and 6 to 10 fathoms close around, is the southernmost of a cluster of shoals lying off the northern end of Öland. From the shoalest part Öland North Point Light bears 238° , distant 23 miles.

Skan Grund, with $3\frac{1}{2}$ fathoms water, lies 1 mile north-northeastward from Gryt Grund. About 1 mile northward of Skan Grund there is a shoal with $3\frac{3}{4}$ fathoms and depths of $5\frac{1}{2}$ to 10 fathoms close around.

Öland North Grund, the northernmost of the outlying shoals, is nearly 1 mile long northwest and southeast, and about $\frac{1}{4}$ mile

broad within the 5-fathoms curve, with a rock near the center, over which there is a depth of $2\frac{1}{4}$ fathoms. Within a short distance around this grund there are depths of 14 to 33 fathoms. From the shoalest part of Öland North Grund, Öland North Point Lighthouse bears 196° , distant $6\frac{1}{4}$ miles.

Buoy—Light buoy.—The northern edge of this shoal is marked by a black spar buoy surmounted by a ball.

A black light buoy showing a flashing white light every 3 seconds is moored about 200 yards northeastward of the above-mentioned black-spar buoy with ball.

When necessary on account of ice, the lightbuoy will be withdrawn.

Shoal.—A steamer is reported (1916) to have touched bottom 1.7 miles 30° from Öland North Point Light. Soundings taken at the time showed a depth of $4\frac{1}{2}$ fathoms.

Clearing marks.—Öland North Point Light bearing nothing southward of 205° , leads eastward, and bearing nothing westward of 187° , leads westward of Öland North Grund; Hunö Bäte, a hill on Hunö in Gäse Fjärd bearing nothing northward of 282° , leads northward, and nothing southward of 290° leads southward of the shoal.

Knolls Grund.—A rocky shoal of $4\frac{1}{4}$ fathoms lies on the northern end of a bank northeastward of Öland North Point, with the lighthouse bearing 225° , distant $15\frac{1}{4}$ miles. A patch with $6\frac{1}{4}$ fathoms lies $3\frac{1}{4}$ miles southward of the above rock and on the same bank.

Directions through Kalmar Sound from the northward to Kalmar.—By day.—When approaching Kalmar Sound from the northward, Kräkelund Beacon, the lighthouse on the north point of Öland and Jungfrun Island are the best landmarks; farther down the sound Borgholm Castle Ruin is conspicuous. Steer toward Jungfrun Island on a course between 190° and 211° and pass on either side of it, but it is better to pass eastward of it, as a straight course can then be steered to Skägganäs by vessels of moderate draft.

From 1 mile eastward of Jungfrun Island a course 200° leads clear of all danger up to the bellbuoy off Skägganäs, passing $\frac{3}{4}$ mile eastward of Dämman Lighthouse, the same distance westward of Lars Persons Grund and over a mile westward of Elefanten; Greby Grund is left 400 yards to port. Pass about 800 yards westward of the bellbuoy off Refsudden on Skägganäs and steer to pass about the same distance off Ipse Point to avoid the shoals southeastward of Skägganäs.

A vessel of heavy draft should avoid the patches of from 4 to $4\frac{1}{4}$ fathoms lying on the course above mentioned and situated about 3 miles northwestward of Borgholm by passing either east or west of them, shaping a course from abreast Dämman to pass about 600 yards westward of the buoy on Elefanten Grund, or about the same distance

eastward of the black and white buoy on the 3-fathoms patch about 8 miles 202° from Dämman.

When Ispe Point Lighthouse is two points abaft the beam, steer 220° heading westward of Kalmar, which leads westward of a 2-fathom shoal with red-broom buoy $\frac{1}{2}$ mile southwestward of Ispe Point and southeastward of Masknaggen, and when abreast the latter shoal steer toward the light and bell buoy moored northward of the entrance to the dredged channel through Kalmar Sound Narrows, northward of which anchorage may be had as convenient, avoiding the shoal of 3 fathoms lying about 1,800 yards northward of Krongrundet. A pilot may be obtained here.

The dredged channel is passed through by leaving the black and black and white buoys to starboard and the red buoys to port.

From Skägganäs a buoyed channel available for vessels of 14½ feet draft leads southward inside the shoals, passing between Hatten and Silläsarne and eastward of Bakare Grund and Bred Grund, which are marked by buoys. The leading mark through is Kalmar Slott close westward of the church, bearing 216°, leaving black buoys to starboard and red buoys to port. A pilot should be obtained at Skägganäs.

In heavy gales from the northeastward the sea breaks violently off Skägganäs, and as there is then also a strong current down the sound the spar buoys are often invisible, thus rendering great caution necessary.

At night.—The lights on Öland North Point, Tokenäs, Horn Point and Furön will serve to determine the position of the vessel, when a course should be shaped to pass 1 mile eastward of Jungfrun Island; thence a course 200° leads about $\frac{3}{4}$ mile westward of Dämman Light, which hitherto has been in sight, fixed white, from the neighborhood of Jungfrun. Pass through the green sector of that light into the southern fixed white sector and remain in it, and also in the northern fixed white sector of Skägganäs Light when it is sighted, until the northern red sector of Ispe Point Light is seen, when keep to the westward until within the white sector of the latter light, and bring it to bear 193°, steering toward it on that course.

About 1½ miles northward of Ispe Point the fixed white sector of light from Grimskär will be entered, when alter course at once, keeping within that sector and steering about 217° for Grimskär Light until Ispe Point Light, which has meanwhile changed to green, then red, again becomes white; then alter course to starboard, keeping within the last-named sector of Ispe Point Light, and steer toward the bell buoy was fixed white light off the northern end of the dredged channel.

The sector of Grimskär Light above mentioned leads over a depth of 3½ fathoms northeastward of Masknaggen, but it may be avoided

by keeping two points to port when Ispe Point Light bears 90° , until the white sector of that light is entered, when proceed in that sector toward the bell and light buoy as before. Care must be taken in the latter case to avoid a shoal of 2 fathoms lying $\frac{1}{2}$ mile southwestward of Ispe Point, which shoal extends into the white sector of light from that point.

If intending to anchor, haul westward when 2 or $2\frac{1}{2}$ miles southwestward from Ispe Point and cross the single red flash and narrow fixed white sectors of Grimskär Light, anchoring as soon as the double red flash sector of that light is entered, in from $4\frac{1}{2}$ to $6\frac{1}{2}$ fathoms.

Both when approaching the bell and light buoy and the anchorage the 3-fathom shoal previously mentioned northward of Krongrundet should be avoided.

The dredged channel is passed through from the northward by keeping the lightbuoys with flashing red lights on the port hand and those with flashing green and fixed white lights on the starboard hand.

East coast of Öland—Landmarks.—The lighthouse on the south point of Öland, already described, is an excellent mark for approaching this coast from the southward and eastward. About $1\frac{1}{2}$ miles northeastward of the lighthouse lies Ottenby Wood, conspicuous from seaward; but farther northward the land becomes barren and very difficult to recognize, unless by following the coast and attentively observing the positions and different appearances of the churches.

About 27 miles northward of Ölands South Point lies Gårdby Grove, which, on a near approach, is tolerably distinct. Farther northward there are also a few trees inland. Borgholm Castle may be seen from a long distance, and Jungfrun Island may sometimes be seen over the low part of the island. The north point of Öland is covered with wood, and is visible from a distance of 12 or 14 miles.

The following few particulars of the churches on the east coast of Öland may prove of service to the mariner: Ås Church, situated about $\frac{1}{4}$ mile northward of Ottenby Wood, has a low tower on its eastern gable. Gräsgård Church, $4\frac{3}{4}$ miles northward of Ås, has a pointed spire with pinnacles over the western gable, and a red tiled roof. Segerstad Church, $3\frac{1}{4}$ miles northward of Gräsgård, has a low tower with cupola over its western gable with a boarded roof.

Hultersta Church, $5\frac{1}{4}$ miles northward of Segerstad, has a low square tower with cupola on its western gable. Stenåsa, 4 miles northward of Hultersta, has a tower and cupola on the western gable, and a red tiled roof. Sandby Church, 4 miles northward of Stenåsa, has a spire over the western gable, showing white.

Gårdby Church, west-southwestward of Gårdby Grove, has a gray tower and cupola over the western gable, and a red roof. North Möckleby, 3 miles northward of Gårdby, is somewhat similar.

Runsten Church, $3\frac{1}{4}$ miles northward of North Möckleby, is a similar building, with the roof black. Långlöt, $2\frac{1}{2}$ miles northward of Runsten, has a tower and a red roof.

Gårdslösa (Gärdslösa), $3\frac{1}{4}$ miles northward of Långlöt, is built in the form of a cross, with a low tower with cupola over the western gable and a boarded roof; Bredsätra, $3\frac{1}{2}$ miles northward of Gårdslösa, has a tower at the western end, with cupola and small spire, and a black roof.

Egby Church, 2 miles north of Bredsätra, has a low tower with cupola surmounted by a cross.

Löt, $2\frac{3}{4}$ miles north of Egby, has a similar appearance, but the tower is higher.

Alböke, $2\frac{1}{2}$ miles northwestward of Löt, has a square white tower surmounted by a dark spire. Föra, 6 miles northward of Löt, has a tower at the western end with a cupola. Southward and northward of Föra there are a few scattered trees. Persnäs, $3\frac{3}{4}$ miles northward of Föra, is built in the form of a cross, and has a low tower with pointed roof at the western end.

Källa New Church, $3\frac{1}{4}$ miles northward of Persnäs, has a high spire. Here the woody portion of the island begins, and the trees become thicker toward the north point. Höghby, $3\frac{1}{4}$ miles northward of Källa, has a tower with sloping roof, surmounted by a cupola and cross; and Böda, 5 miles northward of Höghby, has a tower and cupola at its western end.

Off-lying banks—Ölands South Grund, with $5\frac{1}{2}$ fathoms, rock, and depths of 8 to 9 fathoms close around, lies 12 miles 130° from Ölands South Point Lighthouse; it is situated on the northern part of a bank, 10 miles long north and south, having on it a depth of 16 to 19 fathoms. A wreck lies on Ölands South Grund (1908).

South Middle Bank (Södra Midsjö Banken), of fine and coarse sand, lying about 42 miles southeastward from Ölands South Point, is 12 miles long north-northwest and south-southeast and 6 miles broad within the 10-fathom curve. The depths are from 7 to 10 fathoms, the 7 fathoms being near the south end. A patch of 8 fathoms lies $2\frac{1}{2}$ miles westward of the northern part of the bank.

North Middle Bank (Norra Midsjö Banken), of irregular shape, lies from 20 to 29 miles northward of South Middle Bank; it is $9\frac{1}{2}$ miles long north-northeast and south-southwest and about the same width east and west, and consists of sand and gravel. The general depths on the bank are from 7 to 10 fathoms, but on the northern part there is a patch of $4\frac{1}{2}$ fathoms, lying 88° , distant $33\frac{1}{2}$ miles from Öland South Point Lighthouse.

Caution.—In consequence of the frequent grounding of vessels on the east coast of Öland, especially in thick or foggy weather, the Swedish Government has called the attention of mariners to the fact that grounding on this coast might generally be avoided by sounding in time. Along this coast, extending about 75 miles, the depths at the distance of 5 miles are about 22 to 27 fathoms, and decreasing toward the land, so that at the distance of 3 miles the depths are 10 to 16 fathoms; therefore haul out to the eastward directly the lead gives a depth of about 11 fathoms.

Ostby (Östby) Grund, with less than 6 feet of water, extends a long mile from the shore abreast Östby, about 6 miles northward of the south point of Öland. A black and white spar buoy, with two balls, lies outside Ostby Grund about $1\frac{1}{2}$ miles from the shore.

Gräsgård, situated 8 miles north-northeastward of Ölands South Point has an anchorage about $\frac{1}{2}$ mile northward of it about 600 yards from the shore, and sheltered eastward by a long narrow reef. The depth is $9\frac{3}{4}$ feet at mean level and 1 foot less at low level. The anchorage is exposed to southerly winds. A small amount of water and provisions can be had. Fish is exported in autumn and wood is imported in the summer months. There are no pilots, but fishermen can act as such when wanted.

In Gräsgårds Hamn, about $\frac{1}{2}$ mile northward of the above anchorage, fishing craft of $3\frac{1}{2}$ feet draft find shelter within Gammelbyör Rocks, on which are some fishermen's huts.

Life-saving.—There is a lifeboat stationed at Gräsgård.

Segerstad Light.—Near Segerstad Village stands a gray circular stone tower, 72 feet high, from which, at an elevation of 69 feet above the sea, is exhibited group flashing white lights with red sector, visible 14 miles. (For details, see Light List.)

Near the limits of the sector of white light the flashes appear red and white alternately.

Buoy.—A black and white spar buoy, with ball, is moored a little more than a mile from the shore, east of Segerstad, to mark the shoal extending from the shore off that place.

Långnäsören, southeastward of North Möckleby Church, has a boat harbor, used only by small boats, which, however, have not very good shelter.

Långnäs Point, abreast Runsten Church, has a boat harbor with little shelter.

Skälgrund is a small island close to the shore abreast Långlöt, and forms an anchorage for vessels drawing not over 6 feet. It is, however, exposed to winds between south and east.

Kapell Point Light.—On this point (Ölands Östra), 5 miles northward of Skälgrund, stands a red iron tower, 104 feet high.

from which, at an elevation of 99 feet above the sea, is exhibited a flashing white light, visible 16 miles.

Kapell Reef—Buoy.—A black and white spar buoy, with two balls, is moored $1\frac{1}{4}$ miles southeastward of the lighthouse on Kapell Point, outside the eastern side of Kapell Reef, which extends from the shore.

Marskär, an islet between Egby and Löt Churches, forms a small harbor for vessels drawing 5 feet; with strong winds from southeast to south, a swell sets into this harbor, which can be entered either northward or southward of the island.

Kåreholm Harbor, situated $8\frac{1}{4}$ miles northward of Kapell Point, is formed by a low island named Kåreholm and a reef extending from it in a northerly direction toward the coast.

The harbor has a depth of from $8\frac{1}{4}$ to $9\frac{1}{4}$ feet at mean water level, and can be entered then by vessels drawing $7\frac{1}{4}$ feet, or 16 inches less at low level; the channel leading to the harbor is narrow.

Beacons.—A large stone beacon, unpainted, stands on Vaholms Point.

On the south point of Kåreholm is a white beacon, 13 feet high, with a red band.

Anchorage.—In the road, southward and south-southwestward of the beacon on Kåreholm, anchorage in a depth of about 15 feet, sand and clay, may be obtained. The anchorage is open to easterly winds, and in winter navigation is obstructed by drift ice. In summer vessels of $9\frac{1}{4}$ feet draft can lie safely when the sea is breaking over the outer reefs.

During westerly gales good anchorage may be obtained in a depth of 10 fathoms, sand and clay, 3 miles eastward of Vaholms Point, with Alböke Church bearing 270° and Persnäs Church 348° .

Buoys.—On the southern side of the entrance to the anchorage southward of Kåreholm a black spar buoy with ball is moored near the extremity of the reef, which extends nearly $\frac{1}{4}$ mile in a north-easterly direction from Vaholms Point, and two red spar buoys, with upturned brooms over the ball, mark the northern side of the channel.

Directions.—When approaching, bring Alböke Church to bear 264° , passing northward of the buoy on the reef off Vaholms Point and southward of the two red buoys. The old pilot's house at the harbor, seen under a village northward of Alböke Church, bearing 273° , leads to the anchorage south-southwestward of Kåreholm.

From the northeastward Matkroks Grund is avoided by keeping Löt Church over Vaholms Point, bearing 235° . The point is difficult to make out at a distance, and is indicated by some fishermen's huts and a large beacon. There are no pilots at Kåreholm.

Supplies.—Water and a few provisions can be procured.

Matkroks Grund—Buoy.—Matkroks Grund, with 11 feet of water, lies $2\frac{1}{4}$ miles east-northeastward of Kåreholm, and is marked on its eastern side by a black and white spar buoy with ball.

Outer Grund—Buoy.—Outer Grund, with 2 $\frac{1}{4}$ fathoms on it, lies $2\frac{1}{2}$ miles northward of Matkroks Grund and $1\frac{3}{4}$ miles off shore.

Shoal.—A shoal with a least depth of 4 fathoms is located south-eastward of Outer Grund in (approximately) latitude $56^{\circ} 59' 50''$ N., longitude $17^{\circ} 00' 45''$ E. A black and white spar buoy surmounted by two balls marks the eastern edge of this shoal.

Källa Harbor, near Källa Church, has depth for boats under 6 feet draft; there are piles to secure to.

Högby Light.—On a narrow point situated about $1\frac{1}{2}$ miles south-eastward of Högby Church, from a white open frame tower, 75 feet in height, and at an elevation of 71 feet above the sea, a group flashing white light is exhibited, visible 14 miles. (For details see Light List.)

An off-lying shoal, with 10 fathoms on it, lies 8 miles 150° from Högby Light, on the southern part of a bank $3\frac{3}{4}$ miles long, north-northeast and south-southwest and about 1 mile broad, within the 20 fathom curve.

Böda Bay.—The shore from Kesnäs, $1\frac{3}{4}$ miles northward of Högby Light, trends in a northerly direction $4\frac{1}{2}$ miles to Böda Pay, which is about $4\frac{1}{2}$ miles wide and 2 miles deep. There are several shoals in the bay; Flatbådan with 2 fathoms water, and a depth of 4 to 5 fathoms close around, is the most dangerous, and lies 1 mile from the shore, and nearly on a line between Engerne Point and Böda Church, and about one-third of the distance from the former; Engerne Point, at the northern extremity of the bay, bearing 23° , leads eastward of Flatbådan. Knölen, with $3\frac{3}{4}$ fathoms, marked on its eastern side by a black buoy with a white horizontal band and a ball top mark, is situated $1\frac{1}{2}$ miles eastward of Flatbådan.

Wreck.—The wreck of a steamer (submerged) lies sunk (1916) on Knölen (Knoll).

Vessels may anchor in a depth of 6 to 8 fathoms in Böda Bay during northerly and westerly winds.

Nearly 1 mile westward of Engerne Point stand two beacons which indicate the direction of the telegraph cable between Öland and Gotland.

Böda Harbor lies on the western side of a small headland, which forms the south entrance point of Böda Bay. There is a jetty 87 yards long with $6\frac{3}{4}$ feet alongside, and there is the same depth in the harbor; at low-water level there is 1 foot less. Vessels of 6 feet draft can use this harbor at mean water level and lie alongside the jetty, or secure to piles.

Obstruction from drift ice occurs sometimes from January to March.

Water and a small quantity of provisions can be obtained.

Directions.—Bring Böda Church to bear 236° , and steer for it until Engerne Point bears 34° , when haul westward to bring the leading mark on, a high oak seen over the fourth pier of the jetty from inward, bearing 207° , which leads in until within 300 yards of the jetty head, then turn off to pass it on the port hand. Vessels should secure to the jetty, as the swinging room is very contracted.

Grankulla Viken.—The coast from Engerne Point trends in a northerly direction $3\frac{1}{4}$ miles to Öland North Point and forms the eastern side of Grankulla Viken. This bay is 2 miles deep and $1\frac{1}{4}$ miles wide, with depths of $1\frac{1}{2}$ to $4\frac{1}{4}$ fathoms. A reef, on which there are several rocks above water, extends across the entrance of Grankulla Viken. The entrance channel is dredged to a depth of $12\frac{3}{4}$ feet at mean water level and 11 feet at low level, and passes between the ends of two moles, about 230 feet long, built out from the shore, outside which the channel is 148 feet, and inside 65 feet wide. It is marked on the western side by 3 black and white spar buoys and on the eastern by 3 red broom buoys.

About 800 yards southward of the entrance is a rock awash, marked on its southeastern side by a black and white spar buoy.

Shoal.—A shoal, with $\frac{3}{4}$ fathom, lies about $\frac{3}{4}$ mile southwestward from the entrance, marked on its eastern side by a plain perch.

On the western side of the bay is a loading pier, 360 yards in length, with a depth of 13 feet at the outer end. Wood goods are shipped.

Temman, situated 4 miles eastward of Öland North Point, is a rocky bank about 1 mile in extent, with a depth of $6\frac{1}{2}$ fathoms. Between this bank and the shore there are two shoals with $4\frac{1}{4}$ fathoms on each. The southern, named Lag Grund, lies $1\frac{1}{4}$ miles from the coast, and the northern, named Bred Grund, lies nearly 2 miles from North Point.

CHAPTER IV.

GOTLAND, WITH FÄRÖ AND GOTSKA SANDÖN.

Gotland, the largest island in the Baltic and a part of Sweden, lies about 45 miles from the Swedish coast, and is separated from the northern part of Öland by a channel 30 miles wide, having near the middle a depth of 60 fathoms. The island is of limestone formation, 67 miles long north-northeast and south-southwest, 27 miles across the broadest part, and has an area of nearly 1,200 square miles; the greater part of the coast rises precipitiously from the sea, and forms a plateau from 85 to 140 feet high; there are dense pine forests on the island, and a few detached hills of greater height than the plateau, the highest having an elevation of 223 feet.

The southern end of Gotland forms a peninsula, 9 miles long northwest and southwest, joined to the main part of the island by an isthmus 4 miles long and $1\frac{1}{4}$ to 2 miles across. The western side of this peninsula consists of high barren chalk cliffs, but the eastern side is lower and more wooded. The climate of Gotland is very temperate, and but little rain falls in the summer. The population of the island, estimated at 55,422 on December 31, 1913, are employed chiefly in agriculture and cattle raising. The island is noted for its beet-root cultivation and cement industry.

Local magnetic disturbance.—A large area in which the magnetic conditions are disturbed, exists to the southward of Gotland. (See Index Chart.)

Western coast—Hoborg, the southern extremity of Gotland, is a light-colored limestone cliff, divided by a deep cleft, rising abruptly from the sea to a height of 65 feet, and flat on top; it is distinguished by the lighthouse on Klefven Hill, 132 feet high, lying to the north-eastward.

Hoborgs Reef—Buoy.—On the southern side of Hoborg Cliff there is a low point named Refudden, from which Hoborgs Reef, with from 6 to 18 feet water, extends about 1 mile in a southerly direction. A red spar buoy, surmounted by an upturned broom over a ball, is moored close to the southern extremity of this reef.

Light and whistle buoy.—A red light buoy, with an automatic whistle, exhibiting a flashing white light every 5 seconds, is moored $3\frac{1}{2}$ miles 194° from Hoborg Lighthouse. When necessary the light-buoy will be withdrawn on account of ice.

Hoborg Bank, within the 20-fathom limit, extends 48 miles southward from the southern end of Gotland, with a width of from 20 to 23 miles in the northern part, whence it tapers to the southward. There are several patches of 10 fathoms and less scattered over the bank, the shoalest with $6\frac{1}{2}$ fathoms lying $28\frac{1}{2}$ miles southward of Hoborg. A large portion of the eastern part of the bank has depths ranging from 8 to 15 fathoms, with from 21 to 38 fathoms outside the edge of the bank. A wreck lies on the bank, 9 miles southward of the southern end of Gotland, in about 14 fathoms.

Light.—On Klefven Hill, about 1 mile northeastward of Hoborg Cliff, stands a circular white tower, 71 feet high, from which, at an elevation of 190 feet above the sea, is exhibited a flashing white light visible 20 miles. (For details see Light List.)

Fog signal.—The fog signal consists of a fog gun.

Coast.—The coast north of Hoborg is bare, and as far as abreast Vamlingbo Church, high and steep; wood is first seen about the point at Burgsviken. Northward of Burgsviken the land is again higher, and is wooded past Klintehamn and Vestergarn.

Landmarks.—On Gotland are numerous churches; on that part of the island southward of Burgsviken are those of Sundre and Vamlingbo, and farther north are Fide, Näs, Hablingbo, Silte, and Sproge. Klint Bæcke, eastward of Klintehamn, is a light-colored hill, 170 feet high, wooded on the summit. The two islands, Stora and Lilla Karlsö, are conspicuous, being high with precipitous sides, and visible from 14 to 16 miles in clear weather.

Andersgrund, with 8 fathoms water, and depths of 12 to 14 fathoms close around, lies $2\frac{1}{2}$ miles 303° from Hoborg Lighthouse.

Fishing lights, fixed white, are shown at Klasens, Bjerges, Grumpevik, and Västlands, on dark nights, when the fishermen are at sea.

Burgsviken.—From Hoborg, which is steep to on its western side, the shore trends in a northeasterly direction nearly 8 miles to Burgsviken. Just northward of Hoborg there are several hills; Cleveberget, nearest Hoborg, is the most conspicuous; thence the land slopes gradually toward Burgsviken. Fide Church, about 4 miles northeastward of Valar Light, has a square white tower, with cupola and cross.

This bay is nearly 2 miles wide at the entrance between Nybroskans Point, on the south, and the point nearly 1 mile southeastward of Näs Point, on the north, and extends eastward and northeastward for 5 miles.

In the entrance, toward the south side, there is a small space, where the depth is $4\frac{1}{2}$ fathoms, but for a distance of $2\frac{1}{2}$ miles inward the depths are from $1\frac{1}{2}$ to $2\frac{3}{4}$ fathoms, decreasing toward the shore;

the northeastern part of the bay is shoal, with several rocks above water and awash. About $2\frac{1}{2}$ miles northward of Nybroskans Point lies Näs Point, the northern entrance point of the bay, which is low and barren, but northward and eastward of it the land rises and is wooded.

Dangers—Beacon.—From Näs Point, a reef, named Näsrefvet, parts of which are above water and others awash, extends in a westerly direction 1 mile, and southwesterly $2\frac{1}{2}$ miles; on the northern part of this reef there is a small islet named Torngrund, and about 1 mile southwestward of it there is a white cairn beacon, about 15 feet high.

Buoy.—Near the southwestern edge of Bockstigen, a shoal, with $2\frac{3}{4}$ fathoms of water, $2\frac{1}{2}$ miles southwestward of Näs Point, a red spar buoy, with upturned broom over two balls, is moored in a depth of 4 fathoms. Outside the outer road, 2 miles eastward of Bockstigen, lies a shoal with $2\frac{3}{4}$ fathoms water.

Clearing marks.—Hoborg Light bearing nothing southward of 170° , leads westward of Näsrefvet and Bockstigen, and Öja Church, with a high square tower and lofty spire, over the northern side of a store with red tiled roof at Burgsvik Harbor, bearing 85° leads southward.

Burgsvik range lights in line, or the white sector of Valar Light in sight, also lead southward.

Lights—Valar.—At Valar Village, near Nybroskans (Valar) Point, on the southern side of the entrance to Burgsviken, an occulting white and red light is exhibited from a white tower, at an elevation of 20 feet above the sea, the white light being visible 10 miles and the red 8 miles. (For details, see Light List.)

Range lights are shown from white wooden towers, 30 and 18 feet high, respectively, situated above $1\frac{1}{2}$ miles northeastward of the village of Burgsvik; the rear light is fixed white, at the height of 34 feet above the sea, visible 11 miles; the low light, flashing white, at the height of 15 feet, visible 9 miles. These lights are 234 yards apart and in line bearing 73° , lead in to the anchorage, but over the southern edge of the $2\frac{3}{4}$ -fathom shoal in the road.

Two red harbor lights are shown from lanterns on posts near the jetty at Burgsvik Harbor, 24 and 18 feet above the water, respectively. They are 148 feet apart and when in line bearing 175° , lead through the dredged channel to the jetty.

Anchorage.—Vessels of 18 feet draft can have sheltered anchorage in the outer road, which lies 1 mile west-northwestward of Burgsvik Jetty, in from $3\frac{3}{4}$ to $4\frac{1}{2}$ fathoms, with Vamlingbo Church bearing 178° .

Vessels of 10 $\frac{3}{4}$ feet draft can anchor in the inner road outside the dredged channel, in 14 feet water, bottom sand and clay. Although

with westerly winds a swell sets into this bay the sea is broken by the reef extending from Näs Point.

Dredged channel—Buoys.—From the jetty at Burgsvik, a channel has been dredged in a northerly direction, 273 yards long and 27 yards wide, with a depth of $11\frac{1}{4}$ feet at mean water level. Two red broom buoys mark the eastern side and two black and white spar buoys the western, the outer pair being at the entrance of the channel and the inner pair near the middle. There are three warping buoys, one red, one the eastern side, and two black, on the western side of the channel.

Burgsvik, a village, on the south side of Burgsviken, has a jetty 148 yards long, with a depth of $11\frac{1}{4}$ feet alongside and 1 foot less at low water level. At mean level, with smooth water, vessels of $10\frac{1}{4}$ feet draft can proceed to the jetty. There is a 2-ton crane.

Supplies.—Provisions and water can be obtained, also a little coal.

Communication by steamer takes place with Stockholm, Visby, and the other harbors of Gotland; there is telephone communication.

Pilots.—Burgsvik is a pilot station; pilots attend at Valar Lighthouse and meet vessels outside the shoals, but can not be obtained at night.

Directions.—Steer in with the leading light towers in line bearing 73° , which lead southward of Bockstigen Shoal, and when Valar Lighthouse comes two points before the beam open the mark a little southward in order to pass south of the shoal of $2\frac{3}{4}$ fathoms outside the road, previously mentioned, and when the lighthouse is two points abaft the beam, get the mark on again; when the outer black and white spar buoy is passed on the starboard hand and Vamlingbo Church bears 178° , anchor in the outer road; or continue on the above leading mark past another black and white spar buoy and anchor in the inner road, or when past the buoy steer towards Öja Church and the entrance to the dredged channel, and then between the buoys to the jetty. Two red broom buoys are situated northward of the two black and white spar buoys mentioned, at some distance from the fairway.

When approaching from the southwestward steer 60° for Fide Church until the range light towers come into line, when proceed as before directed.

At night, steer in with Burgsviken range lights, fixed white and flashing white, in line bearing 73° , avoiding the $2\frac{3}{4}$ -fathoms shoal previously mentioned, which will have been passed when Valar Light shows white, bearing 184° , and anchor in the outer road when it bears 210° . If proceeding to the inner road, continue on the line of range lights for a short $\frac{1}{2}$ mile after the Valar Light is obscured and

anchor; to reach the jetty the two red harbor range lights in line, bearing 175° , lead in through the dredged channel.

The coast from Näs Point trends in a northerly direction 13 miles to Skans Point. Between Näs Point and Hammar Point, $1\frac{3}{4}$ miles southward of Skans Point, there are numerous rocks and shoals, some of which extend over 1 mile from the shore.

Telegraph beacons.—On Skans Point stand two beacons, which indicate the direction of the telegraph cable between Gotland and Öland.

Landmarks.—On this part of the coast the following churches are seen: Näs Church, $3\frac{1}{4}$ miles northeastward of Näs Point and $1\frac{1}{2}$ miles from the shore, has a white square tower with spire; Hafdhem Church, $5\frac{3}{4}$ miles eastward of Vaktudden, has a lofty spire; Hablingbo Church, $2\frac{1}{2}$ miles northwestward of Hafdhem, has a low tower with pointed roof; Silte Church, $2\frac{1}{4}$ miles north-northwestward of Hablingbo, has a square tower, with lofty spire; and Sproge Church, $2\frac{1}{4}$ miles north-northwestward of Silte, has a high square tower, surmounted by a spire.

Fishing lights, fixed white, are shown on dark nights when the fishermen are at sea at Vakten, Marboda, Alsvik, Nyork (two lights in line bearing 14°), Klasvik, Buse (two lights in line bearing 358° lead up to landing place), and Kronvall (two lights in line bearing 71°).

Dangers—**Deppo**, a rocky shoal, with 2 fathoms water, and 5 to 7 fathoms close around, lies $3\frac{3}{4}$ miles northwestward from Näs Point and $2\frac{1}{2}$ miles from the coast northeastward of it.

Buoy.—The western edge of this shoal is marked by a red spar buoy with down-turned broom over a ball.

From $2\frac{1}{4}$ to 4 miles northward of Deppo and from $2\frac{3}{4}$ to $1\frac{3}{4}$ miles off Vaktudden lie Lillbritten, Söderpall, and Norderpall, each with $4\frac{3}{4}$ fathoms and a $3\frac{3}{4}$ -fathom patch.

Clearing mark.—Little Karlsö its own breadth open of Hammar Point, leads westward of all these shoals.

Lillgrund, with $2\frac{3}{4}$ fathoms water, and depths of $5\frac{1}{2}$ to 13 fathoms within a short distance around, lies 2 miles southward from Hammar Point and the same distance from the shore to the eastward.

Nygrund, with $6\frac{1}{2}$ fathoms, lies $2\frac{1}{4}$ miles westward of Lillgrund and Breidingen, with $4\frac{3}{4}$ fathoms and $6\frac{1}{2}$ to 19 fathoms around, lies about $1\frac{1}{4}$ miles west of Hammar Point.

Karlsö.—Great Karlsö is about 1 mile in extent, and lies $3\frac{1}{2}$ miles from the shore, abreast Skans Point; in the bay on the northern side a reef named Ramnen extends nearly $\frac{1}{2}$ mile from the shore.

Little Karlsö lies $2\frac{1}{2}$ miles east-northeastward of Great Karlsö, with depths of 18 to 33 fathoms in the channel between and of 6 to 13

fathoms between it and the shore: foul ground extends to the distance of some few hundred yards from the southern side of this island. Anchorage may be obtained on the eastern side of Little Karlsö, and landing may be effected at the fishing village on the northeastern side of the island.

Lights.—Karlsö Light, group flashing white, is exhibited at an elevation of 180 feet above the sea from a white octagonal stone tower over a white dwelling, situated on the northwestern point of Great Karlsö, and is visible 20 miles. The light, when bearing 275° , is obscured by a hill on the island.

From a window in north gable of the same building an occulting white light is exhibited at 157 feet above the sea, visible 16 miles. (For details see Light List.)

Fog signal.—During thick or foggy weather, a siren worked by compressed air is sounded at the lighthouse on Great Karlsö. (See Light List.)

Fishing lights are shown on the mainland eastward of Little Karlsö, at Djupvik (two lights, in line bearing 161°) and at Valbersbodar (Valbergsboda) (two lights, in line bearing 3°) on dark nights, when the fishermen are at sea.

Fröjel Church, with square tower and tall spire, stands $\frac{1}{2}$ mile from the shore, about 3 miles southward of Klinte Harbor.

Klinte Harbor, situated 7 miles northeastward of Skans Point, has a wharf, 142 yards long, which forms the outer part of a break-water extending west-southwestward from the shore for 164 yards.

The depth in the harbor and on the northern side of the wharf is $14\frac{3}{4}$ feet and 1 foot less at low water level; on the south side of the wharf the depth is $9\frac{3}{4}$ feet. On both sides of the wharf are bollards and moorings. Vessels should haul alongside the wharf immediately on anchoring, as there is not room to swing at anchor. At mean level, with smooth water, vessels of $13\frac{3}{4}$ feet draft can enter.

Beacons.—On Varfsholmen on the northern side of the harbor are two white pole beacons, 120 yards apart, and when in line, bearing 55° , the outer beacon, 26 feet high, has a white rectangular top mark, short side up, and the inner, 30 feet high, has a white diamond.

The stays are covered with boarding.

Buoys.—The entrance channel is marked by five red spar buoys on the northwestern side, the outer one having an upturned broom over a ball and the others brooms only.

The southeastern side is marked by three black and white spar buoys.

When necessary on account of ice the outer buoy with upturned broom over a ball will be replaced by a broom mark.

Anchorage.—In the inner road about 200 yards westward of the wharf the depth is 10 feet at mean level, over sand and clay.

In the outer road, about 1,400 yards southwestward from the wharf, the depth is about $3\frac{3}{4}$ fathoms, sand and clay, but vessels drawing more than 15 feet are recommended not to use this anchorage.

Anchorage in fine weather or offshore winds may be obtained in a depth of 6 to 8 fathoms in the outer road, about 1 mile from the nearest shore, northward of the line of range beacons, with Klinte Church bearing 86° ; this church stands on the western side of a hill named Klinte Backe, and has a square tower with lofty spire.

Pilots.—Klinte Harbor is a pilot station; pilots meet vessels outside the shoals except at night, and are necessary for a stranger. When the pilot can not go out a red ball is hoisted at the outer beacon, when a stranger should not attempt to enter.

Directions.—From the northward, bring Klinte Church in line with a lime kiln, bearing 98° , which mark leads toward the outer buoy, with upturned broom over ball, which is left on the port hand; the two beacons in line, bearing 55° , lead through the channel between the buoys.

From the southwestward Little Karlsö open its own height southward of Great Karlsö leads up to the outer buoy.

Communication.—There is railway communication with Visby, and with Slite on the east coast of the island, and steam communication with Stockholm and Gotland ports. There is a telegraph office, also telephone communication.

Supplies.—Provisions and water can be obtained.

Trade.—Wood goods and grain are exported, and groceries imported.

Vestergarn (Västergarn) Harbor, $3\frac{1}{2}$ miles northward of Klinte Harbor, is sheltered from the westward by the small rock Svåltholm and the reef extending northeastward from it. It has a depth of $12\frac{3}{4}$ feet and 1 foot less at low-water level, over sand. A pier 239 yards long has from $5\frac{1}{2}$ to $6\frac{1}{2}$ feet alongside. Vessels of $8\frac{1}{2}$ feet draft can enter at mean level. Vestergarn (Västergarn) Church is built of wood, with a red-tiled roof and a red spire.

Beacon.—A pole beacon, 34 feet high, surmounted by a white triangular topmark, apex upwards, stands southwestward of the church, and when in line with it forms a leading mark toward the harbor.

Dangers in approach.—Between Klinte Harbor and Vestergarn the coast is bordered by reefs and shoal water, and should not be approached within $1\frac{1}{4}$ miles.

Shoal—Buoy.—About 1 mile southwestward of Koholmen, nearly $1\frac{3}{4}$ miles southward of Vestergarn, is a shoal of $1\frac{1}{2}$ fathoms, marked by a red spar buoy with upturned broom.

Utholmen, a low bare islet, $\frac{3}{4}$ mile long north-northeast and south-southwest, and surrounded by a reef, lies $1\frac{1}{2}$ miles westward of

Vestergarn. Shoals extend $1\frac{1}{2}$ miles southward, the outermost having a depth of $2\frac{1}{2}$ fathoms, and nearly $3\frac{1}{2}$ miles northward. On the eastern side of Utholmen a pier extends 62 yards, with 3 feet alongside. Water can be obtained.

Skarlakans Grund, parts of which are nearly awash, is a rocky shoal situated $1\frac{1}{2}$ miles northward of Utholmen; it is about 1 mile long north and south, and $\frac{1}{2}$ mile broad, with depth of $3\frac{3}{4}$ to 7 fathoms close around; midway between this shoal and Utholmen there is a small shoal with $2\frac{1}{2}$ fathoms, and 4 to 5 fathoms around.

Buoys.—A red spar buoy with ball under a down-turned broom is moored near the southwestern edge of Skarlakans Grund, and a black and white spar buoy with one ball eastward of its northern extremity.

The channel between Skarlakans Grund and the shore bank is about $\frac{3}{4}$ mile wide, with depths of 4 to 9 fathoms.

A shoal, with $2\frac{1}{4}$ fathoms water, named Holm Grund, lies in the fairway of the channel, about 1,400 yards north-northeastward of Utholmen, and is marked by a red and black spar buoy surmounted by a cross.

Tripallen Shoal, with 2 fathoms water, and $4\frac{1}{2}$ fathoms close around, lies $\frac{1}{4}$ mile northward of Skarlakans Grund.

Gnisvårds Grund, with $2\frac{1}{2}$ fathoms water, lies about 1,400 yards northward of Tripallen, $3\frac{1}{4}$ miles northward of Utholmen, and 1.3 miles from the coast of Gotland.

Buoy.—Gnisvårds Grund is marked on its northern edge by a red spar buoy, surmounted by two balls under a down-turned broom.

Fröjel Church 3 miles southward of Klinte Harbor in line with the southern end of Utholmen by day, and keeping westward of the occulting sector of Stora Karlsö front light at night lead westward of the shoals extending northward of Utholmen.

Lights—Utholmen.—On the northeastern side of Utholmen, stands a white cylindrical iron tower from which is exhibited an occulting white light with red sector, the white light visible 6 and the red light 4 miles. (For details see **Light List**.)

At Skans Point, Vestergarn, an occulting white light with red and green sectors, elevated 23 feet above the sea, is shown from the gable of a white building. The white light is visible 10, the red 7, and the green light 6 miles. (For details see **Light List**.)

Fishing lights, fixed white, are shown at Valbyte (2 lights, in line bearing 8°) and Bibos (2 lights, in line bearing 116°) when the fishermen are at sea.

Pilots are obtained by day from Klinte Harbor.

Anchorage.—In the road off Vestergarn (Västergarn) there is anchorage in $2\frac{1}{2}$ fathoms, clay.

Utholmen Anchorage, eastward of that islet, has depths of from 5 to $7\frac{1}{2}$ fathoms, sand. Vessels of 18 feet draft can approach the anchorage through the southern and northern entrances, and those of 15 feet through the northwestern entrance at mean level.

Directions.—Approaching Vestergarn from the southwestward, before the western side of Utholmen bears 0° , bring Vestergarn Church Tower in line with the beacon, bearing 47° , which mark, closely preserved, leads between the shoals southward of Utholmen and toward the harbor; a black and white spar buoy and a red and black spar buoy with cross are left to starboard. When Skans Point, northward of the harbor, is in line with the west point of Svältholm, turn to port and anchor when Skans Point is right over Svältholm, with the church tower open north of the beacon.

From the northward the passage inside Utholmen may be used: when about 1 mile westward of Nyrefs Point steer 162° for Fröjel Church, which will be seen a little inside Skans Point; this mark leads eastward of the shoals north of Utholmen, and when the eastern point of Little Karlsö opens eastward of the east side of Utholmen steer for the latter islet, leaving the spar buoy with cross on Holm Grund to port; when Klinte Church opens clear of Skans Point or Sanda Church opens south of Vestergarn Church, steer in mid-channel between Skans Point and Utholmen. When Klinte Church opens southward of the wooded Koholmen Point steer toward the church, and when Vestergarn Church and beacon are in line proceed as previously directed.

Directions for Utholmen Anchorage.—From the southward when at least $2\frac{1}{2}$ miles distant, steer 13° for Skans Point Lighthouse, and when Vestergarn Church tower and beacon are in line steer northward midway between Skans Point and Utholmen Lighthouses and anchor just before the latter lighthouse is abeam.

By the northwestern entrance, when 3 miles from Skans Point Lighthouse, steer toward it on a 115° bearing, leaving Skarlakans Grund red spar buoy with down-turned broom over ball to port. When Utholmen Lighthouse comes a little abaft the beam turn quickly to starboard and steer southward between the lighthouses to the anchorage.

At night, the anchorage may be reached by means of Skans Point and Utholmen Lights. From the southward steer toward Skans Point Light, keeping in the white sector between the bearings of 9° and 17° , and when Utholmen red light is sighted steer northward between the two lights, anchoring when Utholmen Light is obscured.

From the northwestward steer toward Skans Point Light in the white sector between the bearings of 112° and 119° , and when Utholmen white light is sighted steer southward between the two lights and anchor when both lights show red.

The northern entrance should not be used at night by vessels of more than 11 feet draft, as the northern white sector of Skans Point Light does not lead westward of the shoal water extending from the Gotland Shore, outside of which a patch of 3 fathoms lies in the middle of the sector eastward of Holm Grund. To enter steer toward Skans Point Light in the northern white sector until Utholmen white light is seen, when turn to starboard, passing between the two lights, and anchor as described above.

Supplies.—Water can be obtained at Vestergarn, also a small quantity of provisions and coal.

Trade.—The exports are wood and grain; imports, manures and bricks.

Fishing lights.—Near Gnisvård, two fixed white lights are shown from posts, at elevations of 21 and 14 feet respectively; they are in line 93° , 167 yards apart, and lead into the fishing station. They are exhibited from August 1 to the end of the year whenever fishing boats are at sea. White fishing lights are also exhibited at Blåhäll, $2\frac{1}{2}$ miles northward, which are in line when bearing 123° , and are only lighted on dark nights when fishermen are at sea.

Coast.—The shore from Vestergarn trends in a northerly direction $5\frac{1}{2}$ miles to Nyrefs Point, a high headland of a light color, thence northeasterly 9 miles to Visby, which is the principal town in Gotland.

Between Nyrefs Point and Visby are Stafsklint, which is steep and about 140 feet high, also Korpklint and Högklint (about 140 feet), both with precipitous light colored cliffs, wooded on top.

Visby.—The harbor is divided into two parts by a tongue of land about 280 yards long and from 45 to 100 yards wide, which projects southwestward from the northeastern side of the harbor. The inner harbor is about 284 yards long and from 77 to 104 yards wide, with a depth of $14\frac{3}{4}$ feet at mean water level and 13 feet at low level, except in the easternmost part. The outer harbor, partly sheltered by a curved breakwater about 460 yards long, extending southwestward from the shore, has been dredged to a depth of 15 to 18 feet at mean level. The depth in the outer harbor entrance is from 18 to $19\frac{1}{2}$ feet, and in that to the inner harbor $16\frac{1}{4}$ feet. Dredging is in progress.

In the inner harbor there are about 634 yards of quayage and in the outer harbor about 330 yards; railway lines are laid on the quays in the inner harbor and on the breakwater. There is a 15-ton crane.

At mean level and with smooth water vessels of $15\frac{1}{4}$ feet draft can enter the outer harbor, and those of $13\frac{3}{4}$ feet draft the inner. Generally navigation is open throughout the year. When a heavy sea prevails at the entrance it is felt in both harbors.

Visby Harbor—Regulations.—Vessels arriving at Visby will be turned over by the pilots to the harbor master, who will give exact instructions, and the harbor master is to be informed regarding vessel and cargo, the crew and their health conditions.

Berths will be allotted at the quays in turn, and if required by the harbor master jibboom and outriggers are to be got in, anchor, etc., hoisted inboard, yards topped and braced fore and aft. The vessel is to be berthed in the position allotted, and the berth may not be shifted without permission; vessels must shift berth if required to do so by the harbor master.

Vessels not working cargo will only be allowed alongside when it does not hinder others.

Vessels moored with chain cables must puddle and parcel them to prevent damage to the quays, and the gangways used fitted with scotchmen to prevent damage to the quay. Hawsers must be attended, when necessary, to enable other vessels to warp.

For detailed instructions and rules for working ballast, etc., for fires and lights, lying up for the winter, and other matters concerning the harbor the printed regulations should be obtained on arrival and consulted.

Landmarks.—Visby Cathedral, with its high tower and spires, and many ruins of churches, towers, and walls, together with several tall chimneys, are visible from a great distance. St. Göran Ruin, with three pointed gables, lies close northward of the town, and Mynttornet is the tower on the northwestern angle of the town wall.

Shoals—Buoys.—A shoal of 3 fathoms lies outside Visby Harbor, on the southern side of the fairway, and is marked on its northern side by a black spar buoy with ball.

A shoal of 3 fathoms lies rather more than 100 yards outside the end of the breakwater.

A red spar buoy with upturned broom lies about 65 yards westward of the end of the breakwater.

A shoal awash on the southern side of the entrance to the outer harbor is marked on its northwestern side by a black and white spar buoy.

The banks southward of the harbor entrance are liable to shift.

Four white warping buoys lie on the southern side of the entrance channel, and two similar buoys are in the outer harbor.

Lights.—From a gray circular tower, the upper part iron and the lower part concrete, on the southern end of the breakwater at Visby, is exhibited, 24 feet above the sea, an occulting white light. A reflected light is shown from the upper part of the lighthouse over the harbor pier. (For details see Light List.)

Range lights.—Two fixed red lights, the front light elevated 30 feet and the rear light 39 feet above the sea, are exhibited on the

inner quay from supports painted with white and black bands and furnished with triangular daymarks, that on the front support point upward, and on the rear support point downward. The lights are 164 feet apart, and in line bearing 89° , lead into the harbor.

A fixed red light on the southern side and a fixed green light on the northern side of entrance to the inner harbor are shown occasionally for vessels entering or leaving.

Fog signal.—During thick or foggy weather an explosive fog signal is fired from the lighthouse on the southern end of Visby Breakwater in answer to vessel's signals.

Dredger.—When the dredger is in a position where she forms an obstacle to navigation, a red flag is hoisted on a staff on the upper part of the vessel, and is kept flying until she hauls out of the fairway. On the same staff a black ball is hoisted when the dredger is lying north or east of the channel, and two black balls when she is south or west of the same.

Pilots.—Visby is a pilot station; pilots attend in the town and meet vessels outside the road. Should the weather prevent a pilot from going out, a red flag or ball is hoisted at the pilots' lookout on the southern wall of the town. Pilotage is compulsory, even for vessels anchoring in the roads.

Visby Road.—In fine weather or with off-shore winds vessels can anchor in about 23 fathoms, clay and shingle, with the great eastern tower of Visby Cathedral showing between the two western towers (which are smaller), and St. Göran Ruin over Mynttornet.

A good berth in 27 fathoms is the highest tower of the cathedral between the two small ones, and the southernmost of three mills on high ground southward of the town, between two factory chimneys, southward of the town, bearing approximately 168° . The factory has three chimneys, one large and two small; the mill must be between the large chimney and the small one next it.

Or, in 24 fathoms, mud and clay, with the breakwater lighthouse bearing 129° , distant $\frac{1}{2}$ mile.

Vessels intending to proceed into harbor must signal their intention in good time by hoisting two flags at the main-topmast head if desirous of entering the outer harbor, and one flag if on their way to the inner harbor.

Directions.—With on-shore gales the harbor of Visby should not be attempted by a stranger, as experience has shown that the danger of stranding in such a case is very great; a pilot can not be expected to be able to come out under all circumstances.

To enter, when about 1 mile off the entrance, bring the northern angle of the southern tower of the mission church in the southern part of the town in line with the southern angle of the old Custom-house, bearing 92° , which mark leads in past the end of the break-

water; when abreast the end of the breakwater haul to port to pass northward of the black and white spar buoy on the southern side of the channel, after which turn to starboard to enter the inner harbor.

If intending to enter the outer harbor, round the end of the breakwater and steer in toward it, passing northwestward of two white warping buoys and four mooring posts. Vessels moor alongside the breakwater.

Visby—Communication.—Visby, the chief town of Gotland, and an ancient walled city, has railway communication with the principal places in the island, also telegraphic communication throughout the island and with the mainland. Steam communication takes place with Stockholm (three times a week), Nynäshamn, Norrköping, Vestervik (twice a week), Kalmar Sund, and Gotland ports. In winter communication is maintained with Stockholm, Nynäshamn, and Vestervik. There is a State telephone.

Population.—The population was 10,012 (1914).

Repairs.—There are two mechanical workshops, and a very small shipbuilding yard, at which small repairs might be effected. There is a small patent slip, chiefly for barges.

Tug.—There is a small tug at Visby.

Coal.—About 600 tons of coal are in stock (1913).

Supplies.—Provisions in small quantities, water, and ships' stores can be obtained.

Trade.—The imports consist chiefly of manure, bran, oil cakes, engines, and sewing machines; exports are limestone, timber, cement, butter, etc.

Life-saving.—A lifeboat and rocket apparatus are stationed at Visby.

The coast from Visby trends in a northeasterly direction 22 miles to Hallshuk, the north extreme of Gotland, and is precipitous, tolerably high, and wooded, with no outlying dangers beyond the distance of $\frac{1}{2}$ mile from the shore; deep water is found 1 mile from the shore, which can not be approached by the lead in thick weather. The only conspicuous objects are Lummelund and Stenkyrka Churches, both of which have sharp spires, visible from a considerable distance.

Stenkyrkehuk Light.—About 12 miles north-northeastward of Visby stands a white circular iron tower, 49 feet high, from which, at an elevation of 137 feet above the sea, is exhibited a group flashing white light, visible 18 miles. (For details see Light List.)

Lickers Hårbor is a small creek situated $1\frac{1}{2}$ miles eastward of Stenkyrkehuk; during south and southeast winds small vessels will obtain shelter in this creek, in a depth of 3 or 4 fathoms, close to the shore.

Ire Viken, 2 miles eastward of Lickers Harbor, affords sheltered anchorage during southerly and easterly winds; the shore in this bay is shelving. In the western part of the bay is a detached shoal of $2\frac{3}{4}$ fathoms.

Hallshuk is high and steep; it is surrounded by a reef named Harrudsrefvet, not more than 800 yards in width, outside which the depth rapidly increases.

Light.—From a gray dwelling on Hallshuk a fixed light with white and red sectors, visible 13 and 9 miles, respectively, is exhibited at an elevation of 107 feet above the sea. (For sectors see Light List.)

Beacon.—A pole beacon, 61 feet high, with white cross as top-mark, stands close west-northwestward of Hallshuk Lighthouse. The upper part of the stays is covered with white boards.

Kappelshamns Viken, situated at the northern end of Gotland, is 3 miles wide at the entrance, decreasing gradually for a distance of $5\frac{1}{2}$ miles to the head of the bay, where it is not more than $\frac{1}{2}$ mile wide. The bay is free from dangers and has depths of 50 fathoms in the entrance, 30 fathoms near the middle, and 5 fathoms near its head. Svarfvarhuk, on the eastern side of the entrance, is considerably lower than Hallshuk and its light colored.

From Hallshuk (the western entrance point of the bay) the land decreases in height toward the head of the bay, where there are two limekilns, the western named Kappelshamns Kiln and the eastern Storugns; a short distance north of this are the Humsäde lime stores.

Reef—Buoy.—The shores of the bay are bordered by a reef a few hundred yards in width, except near the middle of the eastern shore, abreast Lunderhaga, where the land recedes about a mile and forms a small shallow bay, at the entrance of which lies the Kyrkgrund, with 3 to 4 feet water, marked on its northwestern nedge by a red spar buoy with upturned broom. The bay is shoal for $\frac{1}{2}$ mile from its head.

From Saxhammars Point, the eastern entrance point of Kappelshamns Viken, a reef named Enrefvet extends nearly $\frac{1}{4}$ mile in a northwesterly direction.

Kappelshamn, on the western side of Kappelshamns Viken and $1\frac{1}{4}$ miles from its head, has a pier 81 yards long, with a depth of 11 feet alongside at mean level. Vessels of 11 feet draft can reach the anchorage, where the depth is 13 feet at mean level, but as gales between northwest and northeast throw a very heavy sea into the bay the anchorage and the northern side of the pier are very unsafe. There is anchorage in the road eastward of the pier in $3\frac{3}{4}$ fathoms.

Communication.—There is steam communication with Stockholm, also with Visby and other Gotland ports.

Bläse, situated on the eastern side of Kappelshamns Viken $\frac{1}{2}$ mile southward of Svarfvarhuk, has a pier 93 yards long, with nearly 15 feet of water alongside at mean level.

The bottom near the pier is rocky, but vessels can anchor farther out in about 4 fathoms, sand. Vessels of 12 feet draft can go to the pier.

Storugns, on the eastern side of the bay, $\frac{1}{2}$ mile from its head, has a pier 61 yards long, with 16 feet alongside at mean level. There is anchorage off the place in $3\frac{1}{4}$ fathoms, clay, the best being 100 yards northwestward of the pier; here, it is said, vessels with good anchor gear can ride out gales to which the bay is open. Wooden vessels can be repaired. There is telephone communication.

Light.—A sixth-order flashing light with white, red, and green sectors, is exhibited, at a height of 16 feet, from a white octagonal iron tower on a concrete base, at Storugns. The white light is visible 9 miles, the red light 6 miles, and the green light 5 miles. (For details see Light List.)

Trade.—From the above loading places in the bay, lime, limestone, grain, and wood are shipped.

Supplies.—Water can be obtained at the above-mentioned loading places, and provisions at Kappelshamn and Storugns.

Pilots are obtained by day from the northern entrance to Färö Sound.

Directions.—Lärbro Church shows over the valley at the head of Kappelshamns Viken, and serves as a turning mark for both sides of the bay; vessels in the outer part of the bay may range the church between the pier at Kappelshamn and the dwelling houses at Storugns, and in the inner part of the bay, within a line between Bläse and Godståde, between the above pier and the lime barn at Storugns. A vessel is abreast Godståde when the bell aperture in Fläringe Church is seen open. Lärbro Church, bearing 182° , leads up the middle of the bay.

Falholm, situated 3 miles eastward of Saxhammars Point, lies close to the shore.

Arhamn.—The channel leading to Arhamn lies on the southeastern side of Falholm.

Beacon.—A small pole beacon with a horizontal cask as topmark in line with the remains of a flagstaff northeast of it, leads in through the channel, two black and white spar buoys being left to starboard.

The harbor is very narrow, and is frequented only by small craft drawing up to $10\frac{1}{2}$ feet to load lime and discharge salt and bricks. There is a pier with $10\frac{1}{2}$ feet of water alongside. Northeast winds send in some sea. Water can be procured.

Pilots can be obtained at Färö Sound north entrance.

Nackepall, with $3\frac{1}{4}$ fathoms, lies $1\frac{1}{4}$ miles eastward of the northern end of Falholm, and is the outer part of a bank within the 5-fathom limit which extends 1 mile north from the shore, with deep water close to its northern edge. Between Nackepall and the shore the ground is foul.

Svinggrund is a rocky shoal extending $\frac{3}{4}$ mile northward of Vialms Point, the northeastern point of Gotland. The northern part of this grund, on which the sea breaks heavily, has some rocks above water marked by a black beacon surmounted with a triangular topmark. Svinggrund lies on the western side of the northern entrance to Fårö Sound.

Clearing mark.—Saxhammars Point seen well open northward of Falholm and midway between it and Hallshuk, bearing 260° , leads northward: and the beacon on Hanreflar, western side of Fårö Sound, in line with Bunge Church, bearing 182° , leads eastward of Svinggrund. At night the white sector of Hallshuk Light in sight leads more than a mile northward of Svinggrund.

Eastern coast of Gotland.—The coast from Refudden, the southwestern extremity of Hoborg, trends in an easterly direction $2\frac{1}{4}$ miles to Marshaga Point, thence northeasterly 8 miles to Faludden. There are numerous off-lying dangers on this side of the peninsula which should not be approached nearer than 3 miles or into a less depth than 14 fathoms.

Life-saving.—A lifeboat and rocket apparatus are established in Flisvik, $1\frac{1}{4}$ miles eastward of Refudden.

Reef—Buoy.—From Barshaga Point a reef (forming a continuation eastward of Hoborgs Reef), parts of which are awash, extends more than $\frac{3}{4}$ mile in a southerly direction. Southeastward of the southern extremity of this reef a red spar buoy, surmounted with ball under two upturned brooms, is moored in a depth of 4 fathoms.

Barshaga Grund—Buoy.—Barshaga Grund, with $2\frac{1}{2}$ fathoms water and a depth of $4\frac{3}{4}$ fathoms close around, lies $1\frac{1}{2}$ miles south-southwestward from Barshaga Point. The southeastern edge of this grund is marked by a red spar buoy with upturned broom over two balls.

Light.—A group flashing light with white, red, and green sectors, elevated 43 feet above the sea, is exhibited from a white circular tower, 20 feet high, on the southern end of Heligholm. The white, red, and green lights are visible in clear weather 12, 9, and 7 miles, respectively. (For details see Light List.)

Anchorage.—About 1,200 yards from the western side of Heligholm, a small island close to the shore, 3 miles eastward of Barshaga Point, temporary anchorage with winds between north and east may be obtained in a depth of $4\frac{1}{2}$ fathoms, rock with sand and clay between, about $\frac{1}{2}$ mile from the shore.

Lillgrund—Buoy.—Lillgrund, a rocky shoal lying nearly $3\frac{1}{2}$ miles south-southwestward of Faludden Light and about 1,200 yards from the shore, is awash on the western part, and has 6 to 9 fathoms close outside it. It is marked on its southeastern edge by a black and white spar buoy with ball.

Shoal.—A shoal, with a least depth of $4\frac{1}{2}$ fathoms over it lies about $\frac{1}{2}$ mile east-southeastward from Lillgrund Buoy.

Espebådan—Buoys.—Espebådan, parts of which are awash, as charted, but stated to have 5 feet on it, lies about $\frac{3}{4}$ mile northeastward of Lillgrund, with its outer edge $1\frac{1}{2}$ miles from the shore. The southeastern side of this shoal is marked by a black and white spar buoy with two balls, and the northeastern side by a similarly colored spar buoy surmounted by one ball. A shoal of less than 5 fathoms extends a mile eastward of Espebådan.

Clearing marks.—Hoborg Light bearing 270° , leads southward, and Faludden Lighthouse well open eastward of the lifeboat house, bearing 350° , leads eastward of Lillgrund and Espebådan Shoals.

Enviken.—Between Espebådan and the shore there is a rock named Skäret, on the southwestern side of which lies the anchorage of Enviken. This anchorage is tolerably well sheltered, and will admit vessels drawing 8 feet, but should not be attempted without local knowledge. It can not be recommended, since it is now almost entirely filled with wreckage from vessels that have been stranded on the outer shoals. Eastward of Skäret anchorage may be obtained in a depth of $4\frac{1}{4}$ fathoms.

Fishing lights, fixed white, are shown at Våndborg (two lights, in line 353°), Rumsbod (two lights, in line 308°), and Ömundsbod (two lights, in line 305°), on dark nights, when the fishermen are at sea.

Stockviken, on the southern side of Faludden, will admit vessels of $10\frac{1}{2}$ feet draft at mean level; the holding ground is sand over clay, but the bay is exposed to winds between south and east. The depths in the anchorage are from 13 to 16 feet.

Beacon.—On the northern side of the bay about $\frac{1}{4}$ mile from the shore is a pole beacon with stays surmounted by a cross.

Shoals—Buoys.—a red spar buoy with upturned broom is moored near the southern end of the reef extending southward from Faludden.

Vamlingbo Church, open southward of Hamra Church, leads southward of the reef. Hamra Church has a large gray tower and red room, and is situated $2\frac{3}{4}$ miles, 82° from Vamlingbo Church.

A shoal of 9 feet, lying nearly $\frac{1}{2}$ mile northwestward of the buoy just mentioned, is marked by a black and red spar buoy with cross,

and a similar buoy marks a shoal of $1\frac{1}{2}$ fathoms farther in and westward of the anchorage.

Fishing lights.—Two small white range lights, 96 yards apart, are shown on dark nights when the local fishermen are at sea; in line they bear 322° .

Pilots.—There are no pilots, but fishermen may possibly assist in piloting.

Directions.—Steer 316° toward Öja Church in line with Stockviken Beacon, seen over the eastern angle of a white stone house, leaving the red spar buoy with broom to starboard, and the first cross buoy close to port; anchor inside the latter buoy, when a pole with cross board on top, standing northeastward of Faludden Lighthouse, comes over a gate in a stone wall treading towards the shore northeast of the anchorage.

Faludden Light.—From a white iron decagonal tower, 37 feet in height, on the southeastern extremity of Faludden, a group occulting white light is exhibited at an elevation of 34 feet above the sea, visible 11 miles. (For details *see* Light List.)

Fog signal.—A fog siren, operated by compressed air is sounded at the lighthouse.

Life-saving.—Near the lighthouse there is a lifeboat station, and several buildings.

Briten Reef—Buoy.—Britten Reef, with $1\frac{1}{2}$ fathoms on it, extends 1 mile east-southeastward from Faludden, and is marked by a black and white spar buoy, with ball, moored off its outer end.

Sles Viken.—Between Faludden and Grötlingbo Point 7 miles northward of it, the land recedes about 3 miles and forms the bay named Sles Viken, with depths of 4 to 9 fathoms. Within 1 mile of the shore there is shoal water, with numerous rocks, and from Grötlingbo Point shoal water extends $1\frac{1}{2}$ miles in a southerly direction. About 4 miles north-northeastward of Faludden, and 3 miles from the shore, lies the Grötlingbo Grund, covered with $3\frac{1}{2}$ fathoms water. North-northeastward of Grötlingbo Grund and nearly 2 miles south-eastward from the beacon of Grötlingbo Point is a shoal of $3\frac{1}{2}$ fathoms.

During southwesterly gales sheltered anchorage may be obtained in a depth of $3\frac{1}{4}$ to $4\frac{1}{2}$ fathoms, fine sand over clay, in the southern part of Sles Viken.

Fishing lights, fixed white, are shown at Tubod, and Flunting (two lights, in line 353°) on dark nights when the local fishermen are at sea.

Ronehamn Approaches—Islets—Grötlingboholm is $\frac{3}{4}$ mile long north and south and is situated with its southern end about 300 yards eastward of Grötlingbo Point.

Ytterholmen, situated $1\frac{1}{2}$ miles eastward of Grötlingbo Point, is 1,600 yards long northeast and southwest, low, barren, and surrounded by reefs and islets, which extend more than $\frac{1}{2}$ mile southward and $1\frac{1}{4}$ miles in a northeasterly direction from the islet.

Beacons.—Grötlingbo Point Beacon, $3\frac{1}{2}$ miles south-southwestward from Ronehamn, is a pole, 30 feet high, without stays, and with a white cross as topmark. On the point is a large windmill.

Grötlingboholm Beacon, on the northern point of the islet, is a cairn, 14 feet high, with a pole and square topmark, the whole painted white.

Östergrund Beacon, on some rocks about $1\frac{1}{2}$ miles northeastward of Ytterholmen, is 19 feet high and consists of reinforced concrete, triangular in shape, with a slanting red stripe on its two seaward faces; above the beacon on supports are two boards 8 feet high at right angles to one another, painted white with red diagonal stripes showing to seaward.

Getskär Beacon, on an islet about 1,200 yards southward of the harbor is a white cairn 10 feet high, with pole and white round topmark.

Långord Beacon, westward of the last mentioned, is a white cairn 10 feet high.

Stenrännan Beacons, 1,000 and 1,400 yards, respectively, southward of the harbor, are red pole beacons with stays: the rear (western) beacon has a topmark on top of the pole consisting of a board shaped like a truncated cone, narrow end up, and the front (eastern) beacon has a similar board, narrow end down in the middle of the pole.

In line, bearing 252° , they lead through Stenrännan.

Bankhålet Beacon, immediately north of the harbor, is a red pole with stays and a topmark, consisting of a white square over a horizontal white band. Rone Church, in line with this beacon bearing 323° , leads through Bankhålet.

Tomteboda Beacon, about 1,800 yards northeastward of the pier, is a white cairn with a red band, about 14 feet high, with pole and white square topmark.

Dangers—Buoys.—Espebritten, awash, on the western side of the southern entrance to Ronehamn and about 1 mile southward of Grötlingboholm, is marked on its eastern side by a black and white spar buoy with ball.

Småbritten, with $2\frac{1}{2}$ fathoms, lies on the eastern side of the approach to the southern entrance, within the 5-fathoms line, nearly 1.6 miles south-southeastward of Grötlingboholm and the same distance from Ytterholmen.

Söderbritten, with $2\frac{1}{2}$ fathoms, also within the 5-fathoms line, lies about 1 mile eastward of Ytterholmen. A black and white spar

buoy, with two balls, lies nearly $\frac{1}{2}$ mile east-southeastward of the shoal.

About 5 miles east-southeastward from Ytterholmen is a patch of sand over a mile in extent, with from 8 to 10 fathoms on it, and 11 to 12 fathoms around.

Lillgrund, with $3\frac{3}{4}$ fathoms, lies close to the 5-fathom line, 2 miles eastward of Ytterholmen, and 1 mile northeastward of Söderbitten.

Mellgrund, on the south side of the northern entrance to Ronehamn, has $1\frac{1}{2}$ fathoms on it; a black spar buoy with ball lies about 800 yards northeastward of the shoal.

Skirkgrund (Skrikgrund), with about 5 feet of water over it, lies $\frac{1}{2}$ mile westward of Mellgrund; a black spar buoy with ball is moored northward of the shoal, close to the leading line for the northern entrance. About 300 yards south-southwestward of the buoy is a patch of 2 fathoms.

A shoal on the north side of the channel is marked by a red spar buoy, with upturned broom over two balls, moored about 400 yards west-northwestward of the Skirkgrund Buoy and close to the leading line, with Rone Church in line with Tomteboda Beacon, and Öja Church in line with the mill on Grötlingbo Point.

Isgrund, awash, marked on its southeastern side by a black and white spar buoy, and Vinden, a shoal of 1 fathom, marked on its northeastern end by a similar buoy, lie inside Ytterholmen and on the northwest side of the south channel.

When necessary on account of ice Espebritten black and white buoy, with ball, will be replaced by a plain mark. The red buoy with downturned broom over a ball which lies on the reef westward of Ytterholmen and about 1,400 yards north-northeastward of Esbritten by a broom mark with downturned broom. The black buoy with one ball northward of Skirkgrund by a plain mark, and the red buoy with two balls and upturned broom 400 yards westward of Skirkgrund Buoy by a broom mark.

Channels—Depths.—The southern entrance to Ronehamn, between Grötlingboholm and Ytterholmen, is available for vessels of $12\frac{1}{2}$ feet draft at mean water level as far as Grötlingbo Point Anchorage and for those of $9\frac{1}{2}$ feet draft to the roads and harbor.

The northern entrance, northward of Mellgrund, is available for vessels of 16 feet draft to the outer road, and for those of 9 feet draft to the harbor through the Stenrännan.

Bankhälet Channel, between the outer and inner roads, is dredged to a depth of $16\frac{3}{4}$ feet at mean level and 1 foot less at low level.

Anchorage.—Grötlingbo Point Anchorage between Grötlingboholm and Ytterholmen has depths of from $3\frac{1}{4}$ to $3\frac{3}{4}$ fathoms over clay. A berth in $3\frac{1}{2}$ fathoms is with Grötlingbo Church in line with

the beacon on Grötlingboholm and Fide Church, close southward of the beacon on Grötlingbo Point.

Gansviken Anchorage, northwestward of the northern end of Grötlingboholm, has a depth of about 13 feet at mean level, sand bottom. Sandstone is shipped here. Vessels of $10\frac{1}{2}$ feet draft can reach it from the outer road and those of $9\frac{1}{2}$ feet from Grötlingbo Point Anchorage.

Outer road, eastward and southeastward of Bankhålet dredged channel, has depths of from 22 to 26 feet, over clay. The best anchorage is in $3\frac{3}{4}$ fathoms, with Öja Church close westward of the mill on Grötlingbo Point, and Rone Church over a small white house with red-tiled roof north of the large four-storied warehouse at Ronehamn.

Inner road, a hundred yards southward of the pier, has a depth of about 16 feet over gravel and clay. The Stenrännan and Bankhålet Channels lead into it. At low-water level only a vessel of $13\frac{3}{4}$ feet draft or less can swing.

The Harbor of Ronehamn, 11 miles northward of Faludden Lighthouse, and $3\frac{1}{2}$ miles from Grötlingbo Point, has a depth of $14\frac{3}{4}$ feet at mean water level and 1 foot less at low level, with a bottom of sand and gravel. There is a loading pier about 200 yards long on which railway lines are laid. The depth on the inner side of the pier for 34 yards from the outer end is the same as in the harbor, and on the outer side, for 56 yards from the end, it is from 11 to $12\frac{1}{2}$ feet; inside these limits the depth decreases toward the shore, and at the inner end it is $8\frac{1}{2}$ feet on both sides. Small vessels can careen and repair at the pier.

Dredging.—During dredging operations in the south entrance channel and in the entrance to Ronehamn Harbor, the dredger will exhibit a red flag during the daytime and a fixed red light at night on the side on which vessels must pass.

Pilots.—Ronehamn is a pilot station; pilots meet vessels outside the shoals except at night. The Ronehamn pilots also attend at Grötlingbo Point.

Directions — Southern entrance.—When approaching the southern entrance to Ronehamn between Grötlingboholm and Ytterholmen, before Faludden Lighthouse bears southward of 212° , bring Rone Church in line with, or close eastward of, Grötlingboholm Beacon, bearing 350° , which mark leads between Småbritten and a $3\frac{1}{4}$ -fathom patch previously mentioned; leave Espebritten to port and a red spar buoy with down-turned broom over ball, lying westward of Ytterholmen southwest reef, to starboard.

Having passed the last-mentioned buoy, when Grötlingbo Church comes in line with the mill on Grötlingbo Point, bearing 282° , steer

44°, and when abreast of a red broom buoy on the reef westward of Ytterholmen, anchor in Grötlingbo Point anchorage, as previously described. A vessel of 9½ feet draft can proceed farther on the 44° course, leaving Isgrund and Vinden to port, and passing between the red broom buoy and the black and white spar buoy moored off the northeastern end of the latter shoal. Then steer 341° toward the harbor, and after passing westward of another red broom buoy steer toward Tomteboda Beacon; when Rone Church comes in line with Bankhålet Beacon, bearing 323°, steer on that mark through Bankhålet Dredged Channel, and thence through the inner road to the harbor.

Bankhålet Channel is marked by three pairs of buoys, red broom buoys on the east, and black and white spar buoys on the west side.

Northern entrance.—When approaching the northern entrance to Ronehamn, before Närs Lighthouse bears eastward of 31° bring Eke Church close southward of the customhouse at Ronehamn, bearing 268°, and steer in on that mark passing northward of the buoys marking Mellgrund and Skirkgrund (Skrikgrund); a vessel will be near the position of the Mellgrund Buoy when Öja Church is open a little southward of Östergrund Beacon.

As at present the depth between the Skirkgrund Buoy and the red spar buoy with broom over two balls, 400 yards eastward of it, is not more than 14 feet, vessels drawing more than 13 feet must (under the direction of a pilot) pass near the Skirkgrund Buoy, where the water is deepest. From the red buoy, and not before, steer 224° to the outer road and anchor as previously described. When proceeding from the red buoy to the road, do not stand farther eastward toward Skirkgrund than to have Öja Church in line with the beacon on Grötlingboholm, or farther westward than to have Grötlingbo Church in line with Getskär Beacon.

Or, instead of anchoring in the road, proceed through Bankhålet dredged channel to the inner road or harbor, as previously described.

To pass through Stenrännan to the harbor, steer 259°, from the red spar buoy, with broom over two balls, mentioned above, leaving a broom buoy to starboard and a black and white spar buoy to port, and when about 400 yards past the latter buoy, bring the Stenrännan Pole Beacons in line bearing 252°, which lead through that channel, passing between three broom buoys to starboard and two black and white spar buoys to port, into the inner road, whence steer northward to the harbor.

Communication.—Ronehamn has railway and telegraphic communication; there is steam communication with Stockholm, also with Visby and Gotland ports.

Supplies.—Provisions, water, and ships' stores can be obtained, also a small amount of coal.

Trade.—Exports consist of grain, wood, stone, and farm produce; imports are coal, manure, salt, etc.

Närshamn, situated about $6\frac{1}{2}$ miles east-northeastward of Ronehamn, and northwestward of När Lighthouse, is occasionally used by small vessels, but it is exposed to winds between south and southwest; the bay affords anchorage, in a depth of 13 feet, sand, at a distance of 600 or 800 yards from Näsrs Village; vessels of deeper draft can anchor farther out in from 16 to 20 feet, with the lighthouse bearing about 100° .

To enter, steer for Lau Church Tower, bearing 336° , and when the southernmost point of land to starboard is abeam, steer 354° to the anchorage.

Pilots are obtained from Ronehamn or Ljugarn.

Fishing lights, fixed white, are shown on dark nights when the local fishermen are at sea, at Djupkrok, Nystrand, Hus (two lights, in line 331°), Tomteboda (two lights, in line 353°), Herta (four lights, two at the southwestern and two at the northeastern harbor, each pair in line bearing 331°), and Kapelle (two lights, in line 353°).

När Light.—On the southern extremity of Närsholmen stands a circular iron tower, 53 feet high, painted red with three white bands; from which, at an elevation of 68 feet above the sea, is exhibited a flashing white light visible 14 miles.

From the same tower an occulting white light is exhibited at an elevation of 46 feet above the sea, visible 8 miles over a small sector to the northward. (See Light List.)

Lausholmar is the name of a group, consisting of three low grass-covered islets, surrounded by reefs, situated 5 miles north-northeastward of Närsholmen. Storholm, the southernmost islet, is connected with Gotland by a reef. Skarpholm and Gräsholm, the two northern islets, lie east and west of each other, with a narrow channel between.

Beacons.—Storholm, the southern islet, has a white cairn beacon, about 15 feet high, on its eastern point.

Ljugarn beacon, near the shore of the bay, about $1\frac{1}{2}$ miles west-southwestward from Ljugarn, is a white cairn, 12 feet high, with pole and rectangular board on top.

Reefs—Buoys.—A black and white spar buoy surmounted by two balls, is moored in about 5 fathoms outside the eastern edge of the reef extending about 1,600 yards eastward from Storholm; and a black and white spar buoy surmounted by one ball is moored, in a depth of about 5 fathoms, near the northeastern extremity of the reef extending from Gräsholm.

Clearing mark.—Ljugarn Custom Station Outhouse, in line with the pier, leads northeastward of the reef extending from Gräsholm.

Pilots are obtained by day from Ljugarn.

Anchorage.—In Lau Viken, on the western side of Skarpholm, during easterly and southerly gales, sheltered anchorage may be obtained, especially by vessels of light draft, in a depth of from $2\frac{1}{2}$ to about 4 fathoms, sand and clay. A vessel of 14 feet draft can anchor with Sysne Udde, the southern extremity of Östergarnland, in line with the west side of Skarpholm, and Ljugarn Limekiln, touching the gable of a large yellow house, bearing 348° ; those of 16 feet draft can anchor when the limekiln is right under the house next eastward of it, and the south point of Skarpholm touching the north point of Gräsholm; and those of $17\frac{1}{2}$ feet draft, with the limekiln right under the large house on the rising ground over the eastern part of the pierhead, and Gräsholm hidden behind Skarpholm.

Directions.—To approach the anchorage, passing northward of Lausholmar, steer a suitable course toward Ljugarn, taking care not to go westward of the clearing mark given for clearing the reef off Gräsholm, then with westerly, southwesterly, and southerly courses pass northward and westward of Gräsholm and Skarpholm, and anchor as described above.

Vessels of $9\frac{1}{2}$ feet draft can pass between Storholm and the two northern islets; the north side of this channel is marked by two red spar buoys with brooms.

Lau Church, bearing 269° , leads southward of these buoys and through the channel until När Church is over the northern edge of Nyudden, when steer more northward and anchor as described.

At night steer toward Ljugarn Light within the alternating white and red sector, and when within the occulting white sector of När Light, between 194° and 200° , alter course quickly toward it, until the fixed red sector of Ljugarn Light is entered, when anchor as soon as the vessel is well behind the islets.

Ljugarn Road lies $\frac{3}{4}$ mile southward of Ljugarn Udde, the northern extremity of Lau Viken, and affords, during offshore winds, good anchorage, in a depth of $3\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, sand and clay.

To approach the anchorage, bring Garde Church in line with Ljugarn Beacon, bearing 273° , and steer in on that mark, anchoring when Ljugarn Limekiln is touching the gable of a large yellow house, bearing 348° .

Ljugarn Harbor is formed by a stone pier, 59 yards long, alongside which, and also in the harbor, the depth is 14 feet, and 16 inches less at low-water level.

Westward of the pier the depth at present is not more than $7\frac{1}{2}$ feet. Water can be obtained.

There is communication by telephone.

Pilots.—Ljugarn is a pilot station; pilots meet vessels outside the shoals; they can not be obtained at night.

Light.—From a lantern on the gable of a small white house, 10 feet high, near the harbor mole at Ljugarn, an alternating white and red light is shown seaward and a fixed red light southward over the anchorage. It is elevated 21 feet above the sea and is visible in clear weather, the white light 6 miles, the red light 4 miles. The light is unwatched. (For sectors see Light List.)

Sandviken, on the southern side of Östergarnland westward of Sysne Udde, has a depth of about $3\frac{1}{4}$ fathoms, sand, in the usual anchorage, but is exposed to winds between southwest and southeast; vessels can, however, anchor farther out in about 4 fathoms. Midway between the entrance points of the bay there is a shoal, with $2\frac{3}{4}$ fathoms water, with $3\frac{3}{4}$ fathoms southward of it. To enter bring the limekiln at Skaks to bear 356° , which leads eastward of the above shoal, and when the limekiln on the west side of Sysne Udde is abeam, steer northeastward to the anchorage, which is on a line between the two limekilns and somewhat nearer Sysne Udde. Pilots are obtained by day from Herrvik.

Fishing lights, fixed white, are shown at Djupdya (three lights), Hammarnäs, and two lights at each of the following places, Nabben, Svajde, Långbenne, Gamlehann, Hvitvärs, and Grynge on dark nights when the fishermen are at sea.

The coast from Sysne Udde trends in a northeasterly direction $2\frac{3}{4}$ miles to Kuppen, the eastern extremity of Östergarnland, thence northwesterly $2\frac{1}{4}$ miles to Grogarns Hufvud.

Grogarns Hufvud is tolerably high and bare, otherwise this part of the coast is nearly level, woody, and monotonous in appearance.

Landmarks.—On Kuppen stands a white stone beacon, 14 feet high, with staff and round black board on top, the whole 30 feet high.

About 7 miles westward of Kuppen there is a remarkable hill, named Thorsborgen (Torsburgen), 223 high, which may be seen from a considerable distance seaward; it is flat-topped, and nearly circular, with steep wooded sides except on the south, where it is somewhat sloping.

Skane (Skåne) Refvet—Buoy.—Skane (Skåne) Refvet, awash in many places, extends nearly $\frac{3}{4}$ mile in an easterly direction from the shore, at a short distance south-eastward of Grogarns Hufvud. A black spar buoy with ball is moored, in $3\frac{3}{4}$ fathoms, near the extremity of this reef, which is steep-to.

Clearing mark.—Kuppen Beacon, seen just open of Kuppen Cliff, and bearing nothing eastward of 174° , leads eastward of Skane Refvet.

Herrvik Anchorage.—Temporary anchorage may be obtained in a depth of 6 fathoms, sand, about 400 yards from the shore on the northern side of Kuppen, off Herrvik. The anchorage is open to northerly and easterly winds, except for the little shelter which Östergarns Holme affords. Water can be obtained. There is communication by telephone.

Pilots.—Herrvik is a pilot station; pilots attend at the lookout, and meet vessels, by day, outside the northern and southern entrances to the channel inside Östergarns Holme.

Östergarns Holme is separated from Kuppen by a channel $1\frac{1}{2}$ miles wide, with depths of $6\frac{1}{2}$ to 13 fathoms. The island is about 1 mile long east and west, and $\frac{1}{2}$ mile across, with several red buildings on its northwestern side. The eastern side of the island is low, but rises somewhat towards the western side, which is steep toward the sea.

Light.—On the western side of Östergarns Holme stands a circular white stone tower 68 feet high, from which at an elevation of 101 feet above the sea is exhibited an occulting white light, visible 16 miles. (For details see Light List.)

Fog signal.—A foghorn, worked by hand, is sounded.

Briterne—Buoys.—From Fogle Udde, the northeastern point of Östergarns Holme, three shoals named Briterne, having between them deep channels, extend nearly 2 miles in a northeasterly direction. On the two innermost shoals there is a depth of $1\frac{1}{2}$ fathoms and on the outer shoal $2\frac{3}{4}$ fathoms; close eastward of the latter a black bellbuoy with a white horizontal band is moored, and a black spar buoy with ball in $5\frac{1}{2}$ fathoms marks its northwest side. From the northeast end of these shoals a bank, with 4 to 5 fathoms over it and depths of 7 to 12 fathoms close-to, extends nearly 1 mile in a southerly direction; its southeastern edge is marked by a red spar buoy surmounted with a ball under an upturned broom.

When necessary on account of ice the black bellbuoy with a white band will be replaced by a black mark with a white band.

Clearing marks.—The pilot's house and lookout on Kuppen, over the south point of Östergarns Holme, leads southward, and Östergarns Holme Lighthouse, seen over a sharp projecting point on the north side of the island, bearing 240° , leads northward of Briterne, but inside the black spar buoy with ball, apparently.

Off-lying bank.—A bank of sand, $3\frac{3}{4}$ miles long north and south and $1\frac{1}{4}$ miles broad, with depths of 14 to 17 fathoms over it and from 20 to 58 fathoms close around, lies 18 miles eastward from Östergarns Holme.

Katthammarsvik.—Between Grogarns Hufvud and Hammar Udden, 3 miles northwestward, is a bay the greater part of which is

shoal, and should not be approached within $1\frac{1}{2}$ or 2 miles without local knowledge.

Pilots.—Pilots can be obtained by day from Herrvik, and should be employed by a stranger.

Anchorage.—The outer road, from 1,200 to 1,400 yards north of Katthammarsvik Harbor, has a depth of $3\frac{1}{2}$ fathoms, good holding ground of clay mixed with small stones. The marks for anchorage are Östergarn Church, in line with the old pilot's house with two white chimneys, and the north side of Östergarns Holme in line with Grogarns Hufvud.

Inner road, about 800 yards northeastward of the harbor, has a depth of $3\frac{3}{4}$ fathoms, sand over clay; little sea sets in even with northerly winds.

Vessels of 16 feet draft can anchor here, with Hamra Mansion over the southern point of Lillgrund, or Lindströmska House over the pierhead, and Östergarn Church as for the outer road.

Directions.—When approaching Katthammarsvik bring Gammelgarn Church just open of the slope of Östergarn (Östergarns Klint), bearing 214° , or Vika House under the northwest point of the slope, and steer in on either mark until Östergarn Church comes close westward of the old pilot's house, which mark leads westward of Kullen, a shoal of $2\frac{3}{4}$ fathoms, then steer toward the church and anchor in the outer road in the position given above, or proceed farther into the inner road.

When working in toward the harbor, Katthamra House, seen outside Vikudden, leads eastward of the reefs westward of the entrance.

Katthammarsvik is on the southern side of this bay, about 1 mile westward of Grogarns Hufvud, and has a small protected harbor, accessible by vessels of $8\frac{1}{2}$ feet draft at mean level and $6\frac{3}{4}$ feet at low level.

The principal pier is the Kronbrygga, 160 yards long, with depths alongside of $8\frac{1}{2}$ and $6\frac{3}{4}$ feet at mean and low levels, respectively. Water can be obtained.

Communication.—There is steam communication with Stockholm; also with Visby and other Gotland ports.

Trade.—The exports consist of wood, limestone, and grain; and the imports of salt, groceries, etc.

Hammar Grund—Buoy.—Hammar Grund is a flat, $1\frac{1}{2}$ miles long east and west, and $\frac{3}{4}$ mile across, with from 1 to 2 fathoms on it, but awash on the northern part; the southern edge is marked by a red spar buoy with upturned broom. Between this grund and Hammar Udden there is a channel $\frac{1}{2}$ mile wide, with a depth of $3\frac{3}{4}$ fathoms.

Anesbådar—Buoy.—From the northeastern side of Hammar Grund several small shoals named Anesbådar, with 2 to $2\frac{3}{4}$ fathoms

water, extend over 1 mile in an east-northeast direction; the outer edge of these shoals is marked by a black and white spar buoy surmounted by two balls.

Clearing marks.—Östergarns Holme Lighthouse bearing 164° leads 1 mile eastward of Anesbådar; the clearing mark for Skane Refvet also leads eastward, and Vika House, under the slope of Östergarn, leads southeastward.

Vessels that ground on Anesbådar or Hammar Grund and float off again northward of them are often compelled by on-shore winds to pass between Hammar Grund and the shore, and can use these marks, viz, Lillhammars Hus, under the northern slope of Thorsborgen, bearing 214° , and when Östergarn Church comes on with Vikudden, steer toward it until Hammar Udden is abaft the beam, when the vessel will be past Hammar Grund.

Botvaldaviik, situated about $9\frac{1}{4}$ miles northward of Katthammarsvik, has open anchorage off it, sheltered somewhat by the small islet Sildungen, in 14 feet, over sand and clay. Vessels of 11 feet draft can load here at mean water level; wood is shipped. Water can be procured.

Pilots are obtained from Slite by day.

Slite Hamn.—On the western shore of Vägume Viken, 16 miles northward of Katthammarsvik, lies Slite Hamn, which is sheltered from seaward by the islands mentioned below.

Islands.—Magö, the southernmost, is a barren island, 33 feet high, having on its highest part a beacon; a reef and shoal water extend 600 yards northwestward from the north end of the island. Enholm, the westernmost, has on it some fortifications; foul ground, named Skarfgrund, extends about 600 yards from the south side, and about $\frac{1}{4}$ mile from the north point of this island. Grundet, eastward of Enholm, is a low islet, covered with grass. Asund, the northernmost and largest island, is covered with grass, and is connected with Gotland by a reef, parts of which are above water.

Beacons.—A white stone beacon, 29 feet high, surmounted by a pole, 14 feet high, with horizontal cask as topmark, stands on the highest part of Magö.

Lånna Beacon is a pole, 26 feet high, with round red topmark.

Lights—Magö Island.—A group flashing light, with white, red, and green sectors is exhibited, 43 feet above the sea, from a white octagonal lantern on a white circular concrete tower, 10 feet high, on the southern end of the island. The white light is visible 12, the red 8, and the green 7 miles. (For details see Light List.)

Grundet Island.—A group flashing light with white, red, and green sectors, shown 13 feet above the water from a white octagonal lantern on a concrete base, is exhibited on the southwestern side of

the island. The white light is visible 8, the red 7, and the green 6 miles. (For details see *Light List*.)

Navigable depths.—Djup Loppet (Deep Channel) has a least depth of $4\frac{3}{4}$ fathoms, between Grundet and Enholm.

Stor Loppet, or that westward of Enholm, has a depth of 19 feet; and Smäll Hälet, eastward of Grundet, 11 feet. Alongside the pier at Slite Hamn there is a depth of $14\frac{1}{4}$ feet, and at Lånna Piers, over $\frac{1}{2}$ mile northward of Slite Hamn, there is a depth of $10\frac{1}{2}$ feet; northward of this the bay is foul. At low-water level there is 1 foot less than the above depths.

Shoals—Buoys.—A shoal of 3 fathoms lies 1,100 yards westward of the south end of Magö, and is marked on its western side by a red spar buoy with down-turned broom over a ball.

A black and white spar buoy marks the extremity of the reef extending northward from the north point of Enholm, and a similar buoy is moored at the edge of the reef extending eastward from that islet.

A black and white spar buoy is shown as marking the extremity of the reef extending northward from Grundet Islet.

Pilots.—Slite is a pilot station; pilots attend at the harbor and meet vessels outside Magö in a decked boat; they can not be obtained at night.

Anchorage.—Good anchorage can be obtained, in a depth of about $4\frac{1}{2}$ fathoms, sand and clay, between Enholm and Asund Island; in $4\frac{3}{4}$ fathoms about 600 yards northward of Grundet; also in about $3\frac{1}{2}$ fathoms 400 yards southeastward of the harbor; and in Slite Road, on the western side of Magö, in 6 to 7 fathoms, mud; this latter anchorage is, however, exposed to southerly winds.

Quarantine anchorage.—The quarantine anchorage is situated to the northward and westward of Enholm, bounded on the north by an imaginary line running 82° from the south pier of Slite, and is marked by six yellow buoys.

Directions.—There are three channels leading into Vägume Viken. The Stor Loppet passes westward of Enholm; Slite Mill in line with Lånna Beacon leads into this channel, which is narrow, and should not be used without a pilot. When abreast the western point of Enholm steer north-northeastward to abreast the harbor. The channel northwestward of Enholm has been dredged and is marked by a spar buoy on each side.

Djup Loppet, the channel between Enholm and Grundet, is 400 yards wide, with a depth of $4\frac{3}{4}$ fathoms; to enter, bring Lärbo Church, $2\frac{1}{2}$ miles northward from the head of the bay, either over the western point of Grundet, bearing 346° , or over the eastern point of Enholm, bearing 350° ; the former of the two marks leads east-

ward and the latter westward of the 3-fathom shoal westward of Magö, previously described. When abreast the north end of Magö, bring Lärbro Church midway between Enholm and Grundet, which mark will lead through this channel to the anchorage in a depth of $4\frac{1}{2}$ fathoms, sand mixed with clay, about 600 yards northward of Grundet, when Boge Church is seen over the north point of Enholm; or with a pilot proceed to Slite or Länna.

Smäll Hålet is very narrow. When approaching, pass eastward of Magö and bring Othem Church in line with the south gable of Länna Lime Barn, bearing 313° , which leads through.

Slite Hamn is, next to Färö Sund, the most capacious harbor of Gotland, although the space for deep-draft vessels is rather limited. The harbor itself is formed by two piers, the northern of which is 236 yards long in an easterly direction, and the southern extends northeastward with a length of 93 yards. The depth in the harbor and at the piers is $14\frac{1}{2}$ feet and 1 foot less at low-water level. Outside the piers the depth increases to $3\frac{1}{2}$ and $4\frac{1}{2}$ fathoms in the south part of the road inside Grundet and Enholm. Southerly gales send in some sea. Steam vessels are seldom obstructed by ice.

Buoys.—A mooring buoy lies about 100 yards northward of the center of the northern pier, and another over 100 yards northeastward of its outer end. A warping buoy lies over 100 yards south-eastward of the northern pier end.

Communication.—Slite has railway, telegraphic, and telephonic communication, also by steam vessel with Stockholm and Gotland ports.

Repairs.—Wooden vessels can be repaired at a small shipyard.

Coal.—A small quantity of coal, about 100 tons, is kept in stock.

Supplies.—Good water and provisions can be obtained; vegetables are scarce.

Trade.—Exports consist of limestone, wood, and grain; imports, coal, and piece goods.

Skenalden—Beacon.—Skenalden is a rocky islet situated over 2 miles eastward of Magö, and has on it a red pole beacon with a cross and square top mark. About $\frac{1}{2}$ mile northeastward of Skenalden lies a rock awash named Laugrund.

Hejde Viken, northeastward of Åsund, is exposed to wind between south-southeast and south-southwest. There is a pier built out from the eastern shore, 104 yards in length, with a depth of $12\frac{3}{4}$ feet alongside at mean level, and there is anchorage for vessels of that draft outside the pier.

Pilots are obtained by day from Slite.

Ytterholm is a small island close to the shore, $1\frac{1}{2}$ miles northward of Skenalden; from the southern end of Ytterholm a reef extends nearly $\frac{1}{2}$ mile; the small islet Öskar lies about midway between

the tip of this reef and Laugrund. Kitteln, a small rock above water, lies about $\frac{1}{2}$ mile southwestward of Ytterholm.

St. Olofshamn (St. Olofsholmshamn), situated $3\frac{1}{2}$ miles eastward of Slite and northwestward of Ytterholm, will be recognized by a windmill and a ruined church: the channel leading to the harbor is about 65 yards wide, and will admit vessels of 14 feet draft at mean level and 13 feet at low level.

There is a pier 82 yards in length, with 14 feet alongside, with 1 foot less at low-water level. With high-water level and easterly gales the sea breaks over the reef north of Ytterholm and causes a troublesome sea in the harbor; otherwise it is well sheltered. Water can be obtained. Limestone is shipped.

Pilots can be obtained by day from Slite or Kylej.

Coast.—Between Ytterholm and Smojudde, 1 mile northeastward of it, the land recedes and forms a small bay, in which there is a depth of $3\frac{1}{2}$ fathoms. From Smojudde the land trends in a northerly direction $1\frac{1}{2}$ miles to Lörje.

Beacons.—Lörjebacke Beacon, on the point southward of Lörje, is a white cairn, 11 feet high, with pole and white board, which on the northern side is black.

Lörje Pole Beacon stands $\frac{1}{2}$ mile northward of Lörjebacke Beacon, has stays, and is painted red with a white square board on top.

Lörje Harbor has a depth of $14\frac{1}{2}$ feet, with 1 foot less at low water level, clay bottom. There is a loading pier, 191 yards long, with the same depth alongside as in the harbor, where limestone is shipped. Vessels of $10\frac{1}{2}$ feet draft can enter at mean level through the buoyed channel to the harbor.

Pilots are obtained by day from Kylej; if the pilot has difficulty in getting out owing to a strong southerly wind, a vessel can make for Furillen or Fjaujen Anchorage.

Kylej, situated a few hundred yards northward of Lörje, has a depth of $8\frac{1}{2}$ feet in the harbor, with 1 foot less at low-water level. There is a loading pier, 33 yards long, with the same depth alongside as in the harbor; lime is shipped. A ballast quay, 65 yards long, has 7 feet alongside. The western channel to the harbor lies close past Lörje, and is available for vessels of $7\frac{1}{2}$ feet draft at mean level; the eastern channel can be used by those of $5\frac{1}{2}$ feet draft. Water can be obtained.

Pilots.—Kylej is a pilot station; pilots attend at the harbor, and meet vessels outside the shoals except at night.

Valevik, about $1\frac{3}{4}$ miles northward of Kylej, has anchorage in 13 feet over sand, at mean level; vessels of $8\frac{1}{2}$ feet draft can reach the anchorage by passing eastward and northward of Klasen and Fjaujen, two islands lying eastward of Kylej.

Pilots are obtained by day from Kylej.

Fjaugen Hamn, about 100 yards westward of the north point of Fjaugen, the island northward of Klasen, has depths of from 11 to 23 feet at mean level, and is completely sheltered; the entrance channel near the north point of Fjaugen is very narrow, and there is no swinging room for deep-draft vessels. The anchorage is generally used by vessels of 10 feet draft only. A pier, 82 yards long, where limestone is shipped, extends northward from the west part of the point. Pilots are obtained from Kyllej by day.

Furillen Island lies $3\frac{1}{4}$ miles northeastward of Ytterholm, and is separated from Gotland by a narrow, rocky channel named Lärgrat Sund; the island is nearly 3 miles in length north and south, 1 mile across the broadest part, and thickly wooded. From Söder Udde, the southern extremity of Furillen, a rocky shoal extends more than a mile in a southerly direction, on the extremity of which lie two large white rocks named Grauterne.

Pier.—About the middle of the western side of the island a loading pier extends about 400 yards in a westerly direction, with a depth of $15\frac{1}{2}$ feet at its outer end at mean level, decreasing toward the shore. Wood is shipped.

Lights—Grauterne.—A group flashing light, with white, red, and green sectors, elevated 41 feet above the sea, is exhibited from a circular white concrete tower, with octagonal lantern, 38 feet high, situated on the eastern Grauterne Rock. The white, red, and green lights are visible, respectively, 12, 8, and 7 miles. The light is unwatched. (For sectors, see Light List.)

Furillen Pier.—An occulting light, with white, red, and green sectors, elevated 16 feet above the sea, is exhibited from a white house on framework support, situated on the outer end of Furillen Pier. The white, red, and green lights are visible, respectively, 7, 5, and 4 miles. This light will only be exhibited when steamers are expected at the Furillen Limeworks, or when they are leaving that place.

Furillen Anchorage, westward of Furillen, has a depth of $4\frac{1}{2}$ fathoms, and is open to southerly gales, which throw in a heavy sea.

Pilots are obtained, by day, from Kyllej.

Directions.—When 3 miles distant from Lörjebacke Beacon, bring Bunge Church over the middle of the channel between the mainland and Furillen, bearing 10° , and steer toward it, passing eastward of Laugrund. When the mill at St. Olofshamn is a little abaft the port beam, steer to port to bring Bunge Church touching the point of the mainland, to pass westward of Britgrund, a shoal of 19 feet lying about $1\frac{1}{2}$ miles west-southwestward of Grauterne Lighthouse, and when Rute Missloper Beacon comes in line with the south point of Furillen, resume the original course, and continue until Fjaugen is abeam on the port hand, when turn eastward and anchor when Bunge Church is in line with the west point of Furillen.

Rute Grund, with $3\frac{1}{2}$ fathoms on it, and 7 to 11 fathoms around, lies $2\frac{1}{4}$ miles eastward of the south point of Furillen.

Buoy.—A red broom buoy marks the northern end, and a black and white spar buoy with ball the southeastern end, of Rute Grund.

Clearing marks.—The mill at St. Olofshamn open southward of Grauterne Lighthouse, leads southward, and Rute Church, which stands high, over the north point of Furillen, leads northeastward.

Rute Missloper—Beacon.—Rute Missloper, situated 1.7 miles eastward of the middle part of Furillen, is a low rock of a bright yellow color, having on it a white pole beacon, 21 feet high, with stays covered in with boards. From this rock a dangerous reef extends $\frac{3}{4}$ mile in a southwest direction.

Buoy.—A black and white spar buoy is moored on the southeastern side of the reef extending from Rute Missloper.

Clearing mark.—Skarfgrund Beacon opens eastward of Bungenäs, leads eastward of Rute Missloper.

Skenholmen Anchorage.—Skenholmen, an island lying $\frac{1}{2}$ mile northeastward of Furillen, is very low and difficult to make out from seaward. Between the two islands there is anchorage in $3\frac{1}{2}$ fathoms, clay, sheltered except from southeasterly winds. To enter, bring Bunge Church over a large bush on Skenholmen, and steer on this mark until the fishermen's huts at Sildevik come in line with the western side of Skenholmen, which mark leads to the anchorage. Pilots are obtained by day from Kyllej or Bungeör.

Bungenäs Pier, extending from the western side of the promontory of that name, which is fairly high and wooded, is 240 yards long, and has a depth of $14\frac{1}{2}$ feet alongside both sides, with 16 inches less at low water level. Lime, limestone, and stone blocks are shipped. Vessels lie safely on the northern side of the pier. There in anchorage outside the pier in about $3\frac{1}{2}$ fathoms, sand and clay. Pilots are obtained, by day, from Bungeör or Bungenäs.

Fårö Sund, which separates Fårö from the northeastern end of Gotland, is $6\frac{1}{2}$ miles long north-northwest and south-southeast, and from $\frac{1}{4}$ to 2 miles wide, the broader part being just within the northern entrance; it forms a capacious and secure harbor. The water level is generally higher with westerly than with easterly winds.

Foreign men-of-war are not allowed to navigate Fårö Sund without special permission. For limits of war harbor district, *see* Chapter I.

Navigable depths.—In the northern entrance, between Haureflar and Langsaholmen on Fårö, the navigable channel, which has a depth of 10 feet only, is contracted to a few yards by the shoals extending from either side. The general depths in the sund are 3 to 7 fathoms, mud, but the channel on the east side of Skarfgrund will

not admit vessels drawing more than 19½ feet; those of heavier draft must anchor between Bungeör and Skarfgrund, the channel leading to which, westward of Bungeör, has a depth of 4½ fathoms as charted, but is stated to be available for vessels of 29 feet draft at mean water level.

Shoals in southern approach—Södergrund, a shoal of 4½ fathoms, lies 2½ miles 123° from Bungeör Beacon.

Buoy.—A black and white spar buoy with two balls marks the southeastern side of Södergrund.

Färö Missloper, situated a little over one mile 71° from Bungeör, is a low, rocky islet, surrounded by reefs, which extend 500 yards southwest and southward, about 600 yards northeastward, and about 200 yards from the north and west sides.

Islets—Beacons—Bungeör is a low island lying in the middle of the southern entrance to Färö Sund, and has on it a castellated beacon, 22 feet high and 21 feet wide, with a flagstaff in the center, on which the pilot signal is hoisted. The island is surrounded by a reef which extends 700 yards in a northerly direction; this part of the reef is named Ården. About midway between Bungeör and Ryssnäs, the eastern entrance point of Färö Sund, lies a shoal, with rocks awash, named Österflytan.

Skarfgrund is a low, bare islet lying near the middle of the sund about 1½ miles north-northwestward of Bungeör, having on its western side a white stone beacon or cairn, surmounted by a pole and square topmark of open boards. Skarfgrund is surrounded by a shoal, the northeastern end of which is awash and named Flytan. Between Skarfgrund and the shoal extending from the west shore of the sund there is a narrow channel with 2½ fathoms water, as charted, but stated to be available for vessels drawing 16 feet at mean level.

Haureflar Beacon, on the western side of the narrow northern entrance to Färö Sund, is a white cairn.

Light—Färö Sund Light is shown from a white circular tower, built on Flytan Shoal, about 200 yards east-northeastward of Skarfgrund; it is a flashing light, with white, red, and green sectors, elevated 16 feet above the sea. The white light is visible 9 miles, the red 8 miles, and the green 7 miles; it is unwatched. (For details see Light List.)

Telephone.—A telephone cable crosses Färö Sund about 100 yards northwestward of Skarfgrund, the position of the cable is shown by beacons in line on each shore, and vessels must not anchor in the vicinity.

Pilots.—Färösund Village is a pilot station; pilots attend at the ferry there, at Bungeör in the south entrance, and occasionally at Bungenäs, also at Landsnäs (on Färö) at the north entrance, except

at night. They meet vessels from the southward outside Bungenäs, and those from the northward outside Svingrund. There are pilot signal masts at Bungeör and Landsnäs; a black ball with a white band hoisted at Bungeör or Bungenäs, and a white ball at Landsnäs at the northern entrance indicate that pilots may be had. Pilots for conducting vessels from adjacent places may be ordered at the pilot station at Fårösund.

Anchorage.—There is anchorage nearly over the whole extent of Fårö Sund in depths between $3\frac{1}{4}$ and 7 fathoms. In the outer road, between Bungeör and Skarfgrund, the depth is $5\frac{1}{2}$ to 6 fathoms.

Directions.—Approaching Fårö Sund from the southeastward Bungenäs, the western entrance point of the sund, will be easily recognized, as it is the easternmost and highest part of the wooded land on this part of Gotland. Ryssnäs is a low, rocky point of a light color.

Steer toward Bungeör Beacon on a course between 0° and 310° , and when 2 miles distant from the beacon bring Broa Ferryhouse on the eastern shore of the sund, opposite Fårösund Village, in line with Skarfgrund Beacon, bearing 343° , which mark leads through the channel between Bungenäs and Bungeör; and when Holmudden Light on Fårö is shut in by Ryssnäs Point a vessel is northward of Ården, the reef extending northward of Bungeör, and may anchor, in a depth of $5\frac{1}{2}$ fathoms, sand, about $\frac{3}{4}$ mile north of Bungeör. To proceed farther into the sund, pass about 150 yards eastward of Fårö Sund Lighthouse and steer northwestward toward Fårösund Pier, leaving to starboard two red broom buoys on Hejderefvat, on the Fårö Side.

At night the southern white sector of Fårö Sund Light leads between Bungenäs and Bungeör, and the northern white sector leads in mid-channel up the sund northward of Skarfgrund.

Northern entrance.—To enter Fårö Sund by the northern channel, bring Bunge Church in line with Haureflar Beacon, bearing 182° . This mark will lead east of the Svingrund. When immediately between the low rock named Angrund (Aurgrund) on the Fårö side and Vialms Udde on the coast of Gotland, steer 174° toward the wood between Bunge Church and Fårösund Village to the opening of the sund. Pass close eastward of a black spar buoy with ball lying 300 yards southeastward of Haureflar Beacon, and then close westward of a red broom buoy and a red spar buoy with upturned broom over ball. Having passed the last-named buoy, steer toward Fårösund Pier or anchor anywhere on that course in from $3\frac{1}{4}$ to 7 fathoms. The current is often very strong through the narrows, so that the spar buoys are borne down by it.

Fårösund Village, on the Gotland shore of the sund, about 3 miles from Bungeör, has a pier about 55 yards long, at which the depth is 19 feet at mean water level and 1 foot less at low level. Moorings are laid outside the pier.

Communication with Stockholm and Gotland ports is maintained by steam vessel. There is telephone communication.

Supplies.—Provisions, water, and a small quantity of coal can be obtained; also some ships' stores.

Trade.—Exports consist of grain, lime, and wood; imports, colonial produce.

Farö is about 10 miles long northeast and southwest, with an average breadth of 3 miles, and is of even height and wooded. Färö Church, situated near the shore of Kyrkviken, on the southeastern side of the island, is easily recognized. About 3 miles within the eastern end of the island are some white sand hills, named Ula Hau, visible both from southward and northward.

Southeast coast.—The southeast coast of the island between Hammarudden, 3 miles northeastward of Ryssnäs, and the point southwestward of Ava Village, forms a bay nearly 5 miles wide, the western part of which is named Kyrkviken and the eastern Södersandsviken, separated from each other by a point, and a reef extending $1\frac{1}{2}$ miles in a southerly direction from it. On the outer part of this reef there is a rock above water, named Askegrund, $\frac{3}{4}$ mile south-southeastward of which lies the Vinflytegrunden, with a depth of 6 feet; in the channel between these is a depth of $3\frac{1}{4}$ fathoms. About $\frac{3}{4}$ mile east-southeastward of Vinflytegrunden lies a small shoal of $2\frac{1}{2}$ fathoms, with a depth of $4\frac{1}{2}$ fathoms between.

From the point southwestward of Ava Village a shoal extends nearly $1\frac{1}{2}$ miles in a southerly direction, on the central part of which there is a rock, above water, named Ava Grund. Thence the shore trends in a northeasterly direction $2\frac{1}{2}$ miles to Holmudden, the easternmost, low and wooded, point of Färö.

Off-lying shoals.—The 10-fathoms contour lies from $2\frac{1}{2}$ to $4\frac{1}{2}$ miles from the southeastern side of Färö, and within it are the following off-lying shoals:

Lavergrund, with $4\frac{1}{2}$ fathoms on its northern half, a general depth of $2\frac{1}{2}$ fathoms on the southern part, and with a shoal of 6 feet at the eastern end, is about $1\frac{1}{2}$ miles in extent north and south and $\frac{3}{4}$ mile across. Its southwestern extremity lies $2\frac{1}{2}$ miles east-northeastward from Färö Missloper and $2\frac{3}{4}$ miles from the shore.

Buoy.—A black and white spar buoy with ball is moored close to the eastern edge of the shoal water on Lavergrund.

Clearing mark.—Bungeör Beacon seen open southward of Färö Missloper, will lead southward of Lavergrund.

Hammar Grund, situated midway between Lavergrund and Hammar Udden, is awash on the western part and is steep-to; in the channel between Hammar Udden and this grund the depth is 8 to 10 fathoms.

Digergrund, with $3\frac{1}{4}$ fathoms, rock, and a depth of 6 to 9 fathoms close around, lies $1\frac{1}{2}$ miles east-northeastward of Lavergrund.

Buoy.—A black and white spar buoy with two balls vertical is moored close to the eastern edge of this grund. Färö Light, bearing 5° , leads eastward, and Bungenäs South Point, open southward of Färö Missloper, leads southward of Digergrund.

Kittlarne, situated $1\frac{1}{2}$ miles 105° , from Färö Lighthouse, is a small bank covered with 3 fathoms water, having a depth of 7 to 8 fathoms close around. It is marked by a black and white spar buoy with ball.

Kyrkviken Anchorage.—During off-shore gales sheltered anchorage may be obtained in a depth of about 5 fathoms, mud, in Kyrkviken, eastward from Färö Church; it is open to winds between south and east.

To approach the anchorage, steer 300° for Färö Church, which course leads between Lavergrund and Digergrund, and when 2 miles from the church steer 328° for the anchorage.

Färö Light.—On Holmudden, the eastern point of Färö, stands a circular, white stone tower, 99 feet high, from which, at an elevation of 100 feet above the sea, is exhibited a flashing white light, visible 16 miles. (For details see Light List.)

Fog signal.—During thick and foggy weather a gun is fired.

Northwest coast.—The northwest coast of Färö, between the entrance to Färö Sund and Långhammarshammar, the northern extremity of the island, is clear of outlying dangers, and has some detached rocks like runic monuments; in the bight between the entrance of the sund and Lutterhorn, 2 miles northeastward of it, there are several small rocks on the shoal extending nearly $\frac{1}{2}$ mile from the shore.

At Lutterhorn large vessels can obtain anchorage in a depth of about 10 fathoms, sand, about 400 yards westward of Lutterhorn Udde, which is a low, white point, steep-to on its southwestern side; the anchorage is open to winds between west and north-northeast, through north. Water can be obtained at the harbor of Lutterhorn, now in ruins.

A fishing light, fixed white, is exhibited at Lutterhorn, on dark nights, when the fishermen are at sea.

Digerhufvud is the most noticeable point on this coast.

Ejkeviken Anchorage, north of Ula Hau and sheltered by Norsholm, has a depth of $4\frac{1}{2}$ to 6 fathoms, sand and clay; northeast winds send in some sea. When approaching, avoid a shoal of $3\frac{1}{4}$ fathoms, lying $1\frac{1}{2}$ miles eastward of Norsholm.

Beacon.—On the northeastern point of Norsholm is a white pole beacon, with three four-sided boards which decrease in size from the lower, upward.

Life-saving.—A lifeboat is stationed at Skärsande on the eastern side of Ejkeviken.

Salvoref.—Between Skärsande Udde and Holmudden, $2\frac{1}{2}$ miles southeastward from it, foul ground extends in a northerly direction within the 5-fathom line, to a distance of $6\frac{3}{4}$ miles from Färö Light-house; the northern part of this ground is named Salvoref, and consists of a ridge of sand, gravel, and rock, and is very changeable on the shoalest parts, so that after heavy gales large stretches of it may appear above water, but afterwards wash away.

Innerkullen, on the southwestern side of the reef, generally appears as a small sandbank awash. A detached patch of $4\frac{3}{4}$ fathoms lies a long mile northward of Stenshufvud, $1\frac{3}{4}$ fathoms, the northern part of the reef.

The reef can not be approached by the lead on the west side, which is steep-to; on the eastern side the 10-fathom line is less than a mile from the reef and is steep-to; on the north side the 10-fathom limit is distant $7\frac{3}{4}$ miles from the lighthouse; the depths are irregular and approach by the lead difficult.

From the Färö shore a reef extends $1\frac{1}{2}$ miles toward Salvoref, with a shoal awash, named Tornbullshällan, at its extremity; between it and Salvoref are patches of 2 and $2\frac{3}{4}$ fathoms. Small vessels can pass between Salvoref and Tornbullshällan in fine weather; the shoals generally show through the clear water.

Buoys.—The eastern side of these shoals is marked by seven black and white spar buoys surmounted by single balls, and a black spar buoy, having a top mark of two balls, is moored northeastward of the $4\frac{3}{4}$ -fathoms patch on the northern end of the bank; these buoys are moored in depths generally under 11 fathoms, and in a north and south direction over a distance of $5\frac{3}{4}$ miles, the southernmost buoy lying $1\frac{1}{2}$ miles 118° from Tornbullshällan. The western side is marked by four red spar buoys with brooms turned down over balls, the southern buoy lying south-southwestward of Innerkullen. A black and white spar buoy marks the northern edge of Tornbullshällan.

Clearing marks.—Färö Light, bearing 203° , leads eastward and bearing 168° leads westward of Salvoref.

Gotska Sandön, situated $20\frac{1}{2}$ miles northward of Färö, is a wooded island 138 feet high, $4\frac{1}{4}$ miles long northwest and southeast, and $3\frac{1}{2}$ miles wide; the coast is scattered with sand hills. Bredsand Shoal, with $2\frac{1}{2}$ fathoms water on its outer edge, extends nearly 1,400 yards from the northwestern extremity of the island, and nearly 3 miles northwestward of that point the depth is $5\frac{1}{2}$ fathoms, with 9 fathoms between it and the shore bank. At $2\frac{1}{2}$ miles eastward of the same point and about $\frac{1}{2}$ mile from the shore lies a shoal with $2\frac{1}{2}$ fathoms water and a depth of 5 fathoms close-to; there are no

other outlying dangers beyond $\frac{1}{2}$ mile from the shores of Gotska Sandön.

Lights.—On the northwestern point of Gotska Sandön stands a decagonal lighthouse 78 feet in height, painted black with the upper part white, from which is exhibited at an elevation of 136 feet above the sea a group flashing white light visible 18 miles. In the same tower, at an elevation of 121 feet, a fixed white light, visible 17 miles, shows over a sector to the northward. (For details *see* Light List.)

On Kyrkudden, the eastern extreme of Gotska Sandön, a flashing white light, elevated 41 feet and visible 11 miles, is exhibited from a white octagonal lantern on a white tower 30 feet in height.

On Hamnudden, the southwestern extremity of the island, a group flashing white light, elevated 41 feet and visible 11 miles, is exhibited from a white octagonal lantern on a white tower 23 feet in height.

Anchorage may be obtained during summer in a depth of 7 to 10 fathoms sand, about 1 mile from the shore on the western, southern, and eastern sides of Gotska Sandön. Gales cause such a swell even on the lee side of the island that vessels can not remain.

Sandö Bank, with general depths of 10 to 15 fathoms, is about $1\frac{1}{2}$ to $4\frac{3}{4}$ miles broad, and extends 14 miles in a southerly direction from Gotska Sandön; the shoalest part of this bank, with 5 fathoms, stones, lies $6\frac{1}{2}$ miles, 170° , from the lighthouse on the southwestern point of the island, and $5\frac{1}{2}$ miles farther southward there is a depth of $6\frac{1}{2}$ fathoms, with another of 7 fathoms nearly 2 miles west-north-westward of the latter. On either side of Sandö Bank the depths increase quickly to 25 and 30 fathoms, fine sand.

Kopparstenarne, situated about 9 miles northward of Gotska Sandön, is $3\frac{1}{4}$ miles long northeast and southwest, and nearly $\frac{3}{4}$ mile across; the general depths on this shoal are 4 and 5 fathoms, with 7 to 14 fathoms close around; on the southern end there is a rock with 3 feet water, near the middle a small shoal with 6 feet, and farther north two other small shoals with 2 and $2\frac{3}{4}$ fathoms water. Northward of this bank is another, $2\frac{1}{2}$ miles long in the same direction within the 10-fathoms limit, with a least depth of 7 fathoms; about $1\frac{1}{4}$ miles westward of the northern end of the first-mentioned bank is a shoal of 8 fathoms, and $2\frac{1}{4}$ miles southward of the 3-foot head is a patch of 10 fathoms.

Buoys.—A black spar buoy with ball is moored on the northeastern end, and a red spar buoy with down-turned broom over a ball on the southwestern end of Kopparstenarne.

Clearing marks.—By day the lighthouse on the northwestern point of Gotska Sandön, bearing nothing southward of 186° , leads eastward, and bearing 161° , leads westward of Kopparstenarne.

At night the shoals are covered by a sector of fixed white light from the lighthouse just mentioned, which sector should not be entered.

Light vessel.—About $1\frac{3}{4}$ miles northward of the shoalest spot of Kopparstenarne, and on the shoal of 8 fathoms above mentioned, a light vessel is moored, from which is exhibited a group-flashing white light at an elevation of 26 feet above the sea, visible 10 miles. The vessel has two masts and a red tower from which the light is exhibited; the foremast carries a ball. The hull is painted red with Kopparstenarne in white letters on each side. Remains on station till December 31 if ice and weather conditions permit. (For details see **Light List**.)

Fog signal.—During thick and foggy weather a steam siren is sounded. Should the siren be out of order a bell will be sounded.

CHAPTER V.

THE COAST OF SWEDEN FROM THE NORTHERN ENTRANCE OF KALMAR SOUND TO LANDSORT.

The coast between Kråkelund in (approximately) latitude $57^{\circ} 26'$ North, longitude $16^{\circ} 43'$ east, and Landsort 87 miles in a north-northeast direction from it possesses few natural objects sufficiently conspicuous to be used as landmarks. To facilitate the navigation therefore of this coast and of the numerous intricate channels beacons are erected on the most important points, some of which can be recognized from a considerable distance seaward.

Landmarks.—The principal natural landmarks are Vinö, $3\frac{1}{2}$ miles north of Kråkelund Beacon, wooded and of even height; Hunö Böte, northward of Vinö, a high round hill, visible 20 miles in clear weather; Henriksnäsberg, $2\frac{1}{2}$ miles northwestward of the last named, flat-topped and steep to the south; Hasselö, wooded, lying westward of Storkläppen; and Vindåsen, a hill 5 miles north-northwestward of Storkläppen.

Soundings.—The soundings on this part of the coast are very irregular, and the lead gives no reliable indication of the distance from the shore. When in depths of 45 to 50 fathoms a vessel may as a rule be considered a sufficient distance from the coast, but depths of 58 and 70 fathoms will be found close to some of the shoals about 15 miles southwestward of Landsort, and from 2 to 3 miles farther out are depth of 68 and 74 fathoms, with much shoaler water both inside and outside. Depths of 52 fathoms are found $2\frac{1}{2}$ miles south-southeastward of Landsort and near the shoals, with shoaler water outside.

Caution.—Owing to the intricate nature of the inner channels and the frequent changes in the buoyage the positions and number of the buoys are not to be relied upon.

Kråkelund, situated on the western side of the northern entrance to Kalmar Sound, is of some importance owing to its position on the Inner Skerry Channel leading along the shores of the Provinces Småland and East Gotland to Stockholm.

Beacons—Kråkelund.—At the pilot station Kråkelund, at the eastern end of Yttre Långö, on a point 17 feet above the sea, stands a beacon 39 feet high, to mark the southern entrance into the Skerry Channel. The beacon is a pyramid, painted white, with a triangular

top mark. When necessary, on account of ice, the top mark will be removed.

On Stubbskär, a short distance southward of Kråkelund, there is a low white stone beacon.

Shoals—Buoys.—Southward of Kråkelund there are numerous shoals having deep water close around. Bred Grund, with $2\frac{1}{2}$ fathoms water, and depths of $5\frac{1}{2}$ to 10 fathoms in most directions close around, lies $1\frac{1}{2}$ miles 143° from Kråkelund Beacon. A depth of 17 feet over a shoal lies $\frac{1}{4}$ mile northwestward of Bred Grund, eastward of which there is a black and white spar buoy. A shoal with a least depth of 19 feet is reported (1916) about 200 yards southeastward of the southern end of Bred Grund, and is marked on its eastern edge by a black and white spar buoy surmounted with a ball. This buoy is on the dividing line of the red and white sectors of Soen Light (344°).

Knuts Grund, 1400 yards north-northwestward of Bred Grund, with which it practically forms one shoal, has a depth of $2\frac{1}{2}$ fathoms, and is marked on its western side by a red spar buoy with up-turned broom.

Clearing marks.—Kråkelund Beacon bearing 313° , leads north-eastward, and bearing 332° , leads southwestward of the above shoals.

At night the narrow sectors of flashing white light from Soens and Ekö lead eastward and westward of these shoals.

A shoal with a least known depth of $3\frac{1}{4}$ fathoms has been reported northward of Knallorne Shoal in (approximately) latitude $57^\circ 23' 08''$ N., longitude $16^\circ 44' 18''$ E.

Also, a shoal with a least known depth of $3\frac{1}{4}$ fathoms in (approximately) latitude $57^\circ 23' 20''$ N., longitude $16^\circ 44' 25''$ E.

Inomskärsleden leads from Kråkelund along the coast to the northward, through Oxelö Sund, as far as the skerries off Stockholm.

Navigable depths.—This channel can be used the whole distance by vessels drawing less than $11\frac{1}{4}$ feet at mean level and $10\frac{1}{2}$ feet at low level; pilots can be obtained at several stations. The channel is sheltered from the sea, except in some short stretches.

The different parts of the channel between the following pilot stations can be navigated by vessels of the undermentioned drafts:

	Draft at mean level.	Draft at low level.
	<i>Fect.</i>	<i>Fect.</i>
Kråkelund to Strupö.....	13	10 $\frac{1}{2}$
Strupö to Idö Sund.....	19 $\frac{1}{2}$	18
Idö Sund to Stedsholm.....	13 $\frac{1}{2}$	12
Stedsholm to Kettilö.....	16 $\frac{1}{2}$	14 $\frac{1}{2}$
Kettilö to Arkö.....	23	21 $\frac{1}{2}$
Arkö to Oxelö Sund via Gransö Sund.....	18 $\frac{1}{2}$	16 $\frac{1}{2}$
Arkö to Oxelö Sund via Alen.....	11 $\frac{1}{2}$	9 $\frac{1}{2}$
Oxelö Sund to Safö Sund via Hasselö Sund.....	11 $\frac{1}{2}$	10 $\frac{1}{2}$
Oxelö Sund to Safö Sund via Oxelö Sundet.....	9 $\frac{1}{2}$	8 $\frac{1}{2}$

Kräkelund Entrance—Pilots.—Kräkelund is a pilot station; pilots attend on the eastern point of Yttre Långö and meet vessels from sea outside the shoals.

Directions.—Approaching from the southward when $5\frac{1}{2}$ miles distant, bring Kräkelund Beacon open eastward of Stubbskär Beacon, bearing 0° , which leads eastward of Yttre Rönnerf and westward of Knallarne, Bred Grund, and Knuts Grund; the mark leads over the edge of a shoal with a least depth of $3\frac{1}{2}$ fathoms, which depth, however, is on the north part of the shoal and also near a shoal of $3\frac{3}{4}$ fathoms; only small vessels should take this route. When a few hundred yards from Stubbskär turn northeastward and leave a black and white spar buoy on the reef of Stubbskär to port, then northward between Munkbötet Udde, the next point northward of Kräkelund Beacon, and Lilla Örskär; the entrance channel begins abreast Munkbötet, between two buoys. A pilot is indispensable for proceeding farther.

Approaching from the eastward, steer towards Kräkelund Beacon on a bearing between 275° and 290° , and when a few hundred yards from it follow the previous directions.

At night a pilot must be taken.

Ängösund, between Ekö and the islets eastward of it, called Ängöarne, can be passed through by vessels of 13 feet draft at mean level.

Kjerrsvik, inside Kräkelund, can be approached by vessels of 9 $\frac{3}{4}$ feet draft at mean level. At the anchorage the depth is from 11 to 19 feet and farther out at Herrholms Fjärd, up to $8\frac{1}{2}$ fathoms. The inner of the two narrow sounds determines the draft that can enter. There is a pier 109 yards long, with $6\frac{1}{2}$ feet alongside; wood is shipped. Pilots are obtained from Kräkelund.

Lights—On Soen, about $1\frac{1}{4}$ miles northward of Kräkelund, an occulting light, with white, green, and red sectors, is exhibited from the gable of a small white house, at an elevation of 16 feet above the sea. The white light is visible 8 miles, the red 5 miles, and the green 4 miles, and when being passed a faint white light is seen; it is shown from July 6 to June 6 and is unwatched. (For details, see Light List.)

Ekö Light.—From a small white building on the northeastern point of Ekö, $2\frac{1}{2}$ miles northward of Soen, is exhibited 6 feet above the sea, an occulting light with white, green, and red sectors. When being passed a faint white light is seen. The light is visible 6 miles, the red 4 miles, and the green 3 miles; it is unwatched. Shown from July 6 to June 6. (For details, see Light List.)

Blackan is a group of dangerous shoals, the northernmost of which, with 6 feet water, lies $3\frac{3}{4}$ miles east-northeastward from

Kråkelund Beacon; on the other shoals of this group there are depths of $1\frac{1}{2}$ and $2\frac{3}{4}$ fathoms, with 14 and 20 fathoms close-to.

Light buoy.—The group is marked on its eastern side by a light-buoy painted black with a white horizontal band, exhibiting a flashing white light every 30 seconds, thus: Flash 3 seconds, eclipse 27 seconds.

Garstensgrund, awash. $1\frac{1}{2}$ miles southwestward of Blackan, is marked by a black spar buoy with two balls.

Clearing marks.—Strupö lookout mast, in line with Ljungskär Beacon, bearing 318° , leads northeastward of Blackan.

Engelsmans Grund lies about 1 mile southeastward of Ljungskär, and consists of several small shoals with 8 to 19 feet water.

The easternmost shoal, with 11 feet on it, is marked on its northeastern side by a black spar buoy with ball, and the northeastern end of the grund by a black and white spar buoy.

Beacon.—**Ljungskär**, situated on the northern side of the entrance to Vinö Fjärd, is a rock 23 feet high, having on it a wooden beacon, the upper part of which is covered with boards painted white with an inverted triangle on top.

Shoals—Buoys.—Between Ljungskär Beacon and Bredhäll, a rock about 1,200 yards south-southeastward of it, lies a shoal named Styrbådan with 6 feet water, and another with 8 feet on it about 400 yards westward, each marked on its northern side by a black and white spar buoy.

Strupö—Pilots.—Strupö, situated about $1\frac{1}{2}$ miles northwestward from Ljungskär Beacon, is a pilot station; pilots meet vessels coming from sea outside the shoals, and those in the skerry channel off Strupö. There is no lookout after sunset.

Vinö Fjärd—Directions.—Vinö Fjärd may be entered by vessels drawing 21 feet at mean water level and $1\frac{1}{2}$ feet less at low level, which should steer for Ljungskär Beacon in line with Hunö Böte, a remarkable conical woody hill on Hunö in the entrance to Gåse Fjärd, bearing 298° , this leads northward of Blackan Shoals, and Engelsmans Grund, and thence north of Styrbådan and the shoal westward of it, passing Ljungskär and the island and rock westward of it at the distance of about 200 yards.

A vessel will be abreast Styrbådan when Bredhäll is in line with Jungfrun in the northern part of Kalmar Sound. Having passed the shoal westward of Styrbådan, a stranger should not proceed farther without a pilot.

Another buoyed fairway from the southward to Strupö passes between Blackan and the Orreskären lying to the westward.

Vinö Fjärd leads to several good anchorages between the skerries, and into Gåse Fjärd, 6 miles northwestward of Ljungskär Beacon.

Hunö Sund, southward of Hunö, is available for vessels of not greater draft than $10\frac{1}{2}$ feet at mean level.

Flivik, on the western side of Fliviken, which penetrates southward from Gåse Fjärd, has, in the anchorage, a depth of 14 feet over mud. There is a pier, 36 yards long, with the same depth alongside as in the anchorage. Stone is shipped.

Pilots are obtained from Strupö; by vessels from the northward, from Idö.

Solsta Ström, in Solstaviken, which extends westward from Gåse Fjärd, has a depth of 11 feet at the anchorage at mean level and 1 foot less at low level; there is a pier, 55 yards long, with the above depth alongside; pitprops and wood are shipped.

Communication.—There is steam communication with Kalmar, Oskarshamn, and Vestervik, also places between; there are telephone facilities.

Blankaholm, in the northern part of Solstaviken, has a depth of 30 feet in the anchorage, clay bottom. Oats and sawn wood are shipped.

Slingsö, at the head of Slingsviken, which penetrates northwestward from the northern part of Gåse Fjärd, has a depth of 13 feet at the anchorage, mud bottom. Wood is shipped. There is communication by telephone.

Grop, at the inner end of Gropviken, which extends northward from Gåse Fjärd, has a depth of $6\frac{3}{4}$ feet at the anchorage at mean level, clay bottom. A small loading pier has the same depth alongside: bricks are shipped.

Verkeböcksviken—Navigability.—Verkeböcksviken can be entered and the places mentioned below approached, by vessels of $19\frac{1}{2}$ feet draft through the skerry channel from Strupö, those of 23 feet from sea southward of Fyrken, $19\frac{1}{2}$ feet from Idö Sund, and past Bussan, and those of $13\frac{3}{4}$ feet through the channel close southward of Händelöp.

Long-continued easterly winds frequently cause a low-water level in Verkeböcksviken.

Pilots for Gunnebo and Verkeböck are obtained from Strupö or Idö.

Gunnebo, on the south shore of the inner part of Verkeböcksviken, has anchorage off it in from 16 to 21 fathoms, mud, clay, and rock. There is a quay about 65 yards long, with 16 feet alongside at mean level, and 1 foot less at low level, also a short pier at which the depth is $9\frac{3}{4}$ feet. The Skärgård steamers call, and there is communication by telephone.

Trade.—Exports consist of chains, nails, and other ironware; coal is imported.

Verkeback, at the head of Verkebacksviken, has a depth of from $3\frac{1}{4}$ to $7\frac{1}{2}$ fathoms at the anchorage, mud bottom. There are seven short piers, at which the depths are from 8 to 16 feet at mean water level, and 1 foot less at low level; also a quay, 107 yards long, furnished with railway lines; outside the piers the depth is 16 feet.

Communication.—There is railway communication and telegraph and telephone facilities; the Skärgård steamers call also.

Trade.—Exports consist of iron and wood; imports are coal and iron ore.

Approaches to Idö Sund—Beacons—Idö Stångskär Beacon, in the southern approach to Idö Sund and Vestervik, is a pole beacon, 49 feet high, with white square top mark; the upper part of the stays is covered with white boarding. The beacon stands on ground 23 feet above the sea.

Spärö Beacon, 3.3 miles 325° from Idö Stångskär, is a white square stone tower, 82 feet high, with dark pointed roof; it can be seen in clear weather from a distance of 18 to 20 miles seaward, and is considered one of the best landmarks on this part of the coast. Spärö is barren, 124 feet high, and lies in the channel to Vestervik, about 1 mile westward of Idö.

Stångskär Beacon, about 1,600 yards northwestward from Stickskär Light, is a white cairn, 12 feet high, with a red horizontal band.

Tallskär Beacon, about $1\frac{1}{4}$ miles northward of Spärö Beacon, is a white board, 20 feet high, in the shape of an isosceles triangle, apex downward.

Caution.—The balls will be removed from the marks outside and in the neighborhood of Idö when the ice begins to drift.

Damman, (Dämman) Beacon, $2\frac{1}{4}$ miles northeastward from Idö Stångskär, is an iron pole, 21 feet high, surmounted by a ball over a horizontal cask, both painted red and white.

Damman Rock is about 3 feet high.

Shoals with little water on them lie north and south of Damman.

Off-lying dangers—Buoys—Vinkel Grund.—Örö Sanka is a rock above water, situated $5\frac{1}{2}$ miles northward of Ljungskär Beacon. South and east of this rock there are several shoals, the easternmost of which, named Vinkel Grund, with $2\frac{3}{4}$ fathoms water, is marked on its eastern edge by a black and white spar buoy with a ball.

Clearing marks.—Spärö Beacon in line with Idö Stångskär Beacon, or the latter beacon bearing 329° , seen between Spärö Beacon and Kungsklinten, a rock hump on the southeastern point of Krokö, the island between Spärö and Idö, leads northeastward of Vinkel Grund and the other shoals round Örö Sanka. At night Spärö and Idö Stångskär Lights in line 323° lead northeastward.

Fyrken, with 5 feet on it, lies $1\frac{3}{4}$ miles southeastward from Idö Stångskär, and is marked on the eastern side by a black spar buoy with ball. A shoal of $4\frac{3}{4}$ fathoms lies $\frac{3}{4}$ mile eastward of Fyrken.

Händelöpsgrund, with $2\frac{1}{4}$ fathoms on it, lies nearly 3 miles east-southeastward from Idö Stångskär, and is marked on its eastern side by a black and white spar buoy with two balls. Shoals with depths of $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms lie northward, northeastward, and eastward of Händelöpsgrund.

Idöbänkar are some small rocks above water, lying 2 miles eastward of Idö Stångskär.

Kungsgrund, awash, lies $2\frac{1}{4}$ miles east-southeastward from Damman Beacon, and is marked on its eastern side by a black and white spar buoy with ball. Close southwestward of Kungsgrund is a shoal of $1\frac{3}{4}$ fathoms, and midway between Kungsgrund and Damman is Storgrund, with 5 feet on it.

Clearing mark.—Spärö Beacon open northward of Damman Beacon leads northward of Kungsgrund and Storgrund.

Hammar-skärsgrund, with $3\frac{1}{2}$ fathoms over it, lies $1\frac{3}{4}$ miles east-northeastward from Damman (Dämman) Beacon.

A shoal with a least depth of $3\frac{3}{4}$ fathoms over it is located in approximately latitude $57^{\circ} 43' 30''$ north, longitude $16^{\circ} 53' 55''$ east. A large spar buoy is moored on the eastern side of this shoal.

A shoal with a least depth of $4\frac{1}{2}$ fathoms over it is located in approximately latitude $57^{\circ} 42' 50''$ north, longitude $16^{\circ} 54' 25''$ east. A large spar buoy is moored on the eastern side of this shoal.

A shoal with a least depth of $4\frac{1}{2}$ fathoms over it is located in approximately latitude $57^{\circ} 40' 53''$ north, longitude $16^{\circ} 55' 00''$ east. A large spar buoy is moored on the eastern side of this shoal.

Clearing marks.—Spärö Beacon bearing nothing northward of 270° , leads northward, and, bearing 278° , open northward of Damman Beacon, leads southward of Hammar-skärsgrund.

Magtlösan, with $1\frac{1}{2}$ fathoms, lying $1\frac{1}{2}$ miles northward of Damman, is marked on its southeastern side by a red spar buoy with up-turned broom.

Finnknallen, with 3 fathoms over it, lying northward of Magtlösan, is marked on its northeastern side by a black spar buoy with two balls.

Blacken, awash, lies a short distance southwestward of Finnknallen.

Syningsknallen and Långgrund are two shoals, with $4\frac{3}{4}$ fathoms on them, about 1,600 yards apart northwest and southeast, lying about $2\frac{1}{4}$ miles north-northeastward from Finnknallen.

Lights—Bussan.—On Bussan Islet, 1 mile southwestward of Idö Stångskär, from a lantern on the gable of a white house, an occulting light with white and red sectors is exhibited at an elevation

of 31 feet above the sea. The light is unwatched. The white light is visible 6 miles and the red 4 miles. (For details, see Light List.) Shown from July 6 to June 6.

Idö Stångskär.—On Idö Stångskär, 1 mile northeastward of Bussan Islet, a fixed light, with white, red, and green sectors, is exhibited from a lantern on the gable of a white house at an elevation of 31 feet above the sea. The white light is visible 6 miles, the red light 4 miles, and the green light 3 miles. The light is unwatched. (For sectors see Light List.)

Idö Sund, between Idö and Krokö to the westward, has a depth of $5\frac{1}{2}$ fathoms stiff clay; the best anchorage will be found in the southern part of the sund near the Idö shore. Two black and white spar buoys mark the edge of the shoal ground extending from the eastern side of Krokö.

Navigable depths.—The southern entrance to Idö Sund lies close eastward of Idö Stångskär, and the northern approach passes between the shoals extending from the north end of Idö; both channels are available for vessels of $19\frac{1}{2}$ feet draft.

Spårö Sund can be used by vessels of $16\frac{1}{4}$ feet draft, the channel to Vestervik by Tallskär Beacon by those of 19 feet; and that southward of Stångskär Beacon by those of $14\frac{3}{4}$ feet at mean water level; at low-water level 1 foot less.

Idö is an island about 1,200 yards long north and south and some 800 yards wide, situated about 1 mile eastward of Spårö and $2\frac{1}{4}$ miles northward from Idö Stångskär.

Pilots.—Idö is a pilot station; pilots attend on the island and meet vessels from sea outside the shoals north and south of Idö and in the channel; they have a decked motor boat and can communicate by telephone.

Lights—Idö.—On the northwestern point of Idö an occulting light with white and red sectors is exhibited at an elevation of 11 feet above the sea from a lantern on the gable of a white house. The white light is visible 6 miles and the red light 4 miles. The light is unwatched. (For details see Light List.)

Stickskär.—On Stickskär, situated on the western side of the northern entrance to Idö Sund, from a lantern on the gable of a white house, an alternating white and red light is exhibited at an elevation of 29 feet above the sea; a fixed red sector is also shown in a northwesterly direction to the northward of the fairway through Marsholm Sund. The white light is visible 6 miles and the red 4 miles. Stickskär Light is unwatched.

Spårö.—On the southern part of Spårö stands a white tower on a red dwelling, 22 feet high, from which, at an elevation of 118 feet above the sea, is exhibited a white and red alternating, fixed, and group flashing light visible 14 miles. (See Light List.)

On Marsholmshällan, situated about 1,400 yards northward of Spårö Beacon, an occulting white light is exhibited, at an elevation of 16 feet above the sea, visible 6 miles. The light is unwatched and is exhibited when navigation is open. (For details see Light List.)

On Skansholmshällan, at the entrance to Lucerna Fjärd, and 1.3 miles 325° from Spårö Beacon, a fixed white light is shown when navigation is open. Unwatched.

Gränsö Light, occulting, with white and red sectors, visible 6 and 4 miles, respectively, is shown on Hvitudden, northern end of Lucerna Fjärd, when navigation is open. Unwatched. (For details see Light List.)

At the entrance to Vestervik the channel is marked on the northern side by two fixed red lights, which in line lead from Lucerna Fjärd to Lilla Blockholm Sund; on the southern side by two fixed white lights, which in line astern lead up toward the town; a red light is also shown on the quay at Vestervik.

Anchorage.—Besides Idö Sund, previously mentioned, anchorage may be obtained in Lindö Djupet, southward of Spårö, in from $6\frac{1}{2}$ to $12\frac{1}{2}$ fathoms, clay; also in Lucerna Fjärd, westward of Gränsö, in from 9 to 11 fathoms.

Directions.—When approaching the southern entrance to Idö Sund, steer for Spårö Beacon, on a 323° bearing, and when Idö Stångskär Beacon is seen bring Spårö Beacon or Lighthouse in line with the lighthouse on Idö Stångskär, bearing 323° ; this leads close to the eastern side of Fyrken and $\frac{1}{2}$ mile southwestward of N. Blacken Broom Buoy; thence the fairway passes between Boskären (a cluster of dark rocks $\frac{3}{4}$ mile southeastward of Idö Stångskär) on the east, and Simpåbden, a shoal with 5 feet on it, marked by a black and white spar buoy, on the western side of the channel. When abreast Hanunklabbarne, a small rock on the eastern side of the channel, 600 yards north-northwestward of Boskären, steer more to the northward and pass about 200 yards eastward of Idö Stångskär, off which a black and white spar buoy marks the edge of shoal water; outside the buoy is a patch of $2\frac{1}{2}$ fathoms, to avoid which keep 350 yards from the islet.

Northeastward of Idö Stångskär there are some tolerably high rocks named Elgsbådarne; a short distance northwestward of these rocks there is a sunken rock on which the sea breaks; its western edge is marked by a red spar buoy with broom. The channel then leads between this buoy and the black and white spar buoy on the eastern side of Ledsikären 300 yards westward of it; between the buoys and nearer the red buoy than the other is a patch of $3\frac{1}{4}$ fathoms, marked by a spar buoy with cross. A vessel is in the middle of this part of the channel when Rågbådan, a small rock lying 800 to

1,000 yards southward of Krokö, is in line with the western slope of Spårö, bearing 320° , and continuing on this mark a shoal of $2\frac{1}{4}$ fathoms, marked by a red broom buoy, is left to starboard, and farther on, a shoal of 6 feet, with a broom buoy on its western and a black and white spar buoy on its eastern side, is left to port. Thence steer for the middle of Krokö until a $3\frac{1}{4}$ fathoms shoal, lying 600 yards southeastward of Rågbådan is passed, when turn to port and leave Rågbådan and a $2\frac{3}{4}$ fathoms shoal northwestward of it, on the port hand, at a distance of 300 yards. When Spårö Sund is seen open steer through it, after passing which a pilot is indispensable; or anchor in Lindö Djupet.

From the last-mentioned buoyed shoal of 6 feet, Idö Sund may be steered for when open, where anchorage may be taken up or a pilot obtained.

At night, Spårö and Idö Stångskär Lights in line bearing 323° lead in until near the latter rock, after passing which the northwestern narrow white section of Idö Stångskär Light leads up to the entrance to Idö Sund.

The northern entrance to Idö Sund may be approached, coming from the east-southeastward, between Damman (Dämman) on the south, and Magtlösan on the north, avoiding Hammarskärs Grund and the two shoals about $\frac{1}{4}$ and 1 mile northeastward and northward, respectively, from it; or if from the northeastward by passing northward of Finnkullen and Blacken.

In the first case steer 289° toward Stångskär Cairn Beacon, which leads north of Kungsgrund and Storgrund, and south of Hammarskärsgrund, and then between Damman and Magtlösan. Farther on pass southward of Norra Båden, a shoal of $1\frac{1}{4}$ fathoms, marked by a spar buoy with cross, and northward of Kasten and some other small rocks north of Idö; a shoal of $2\frac{1}{2}$ fathoms lies $\frac{1}{4}$ mile northward of Idö.

To proceed hence to Vestervik a pilot is necessary, but if one is not on board and the vessel is proceeding to Idö Sound, turn westward and southward when the sund opens, and with a course 191° steer toward it, passing eastward of a shoal of $1\frac{1}{2}$ fathoms marked by a black and white spar buoy, and of Stickskär Light, and westward of Kastrefvet, marked by a red spar buoy with up-turned broom over a ball. After passing the latter buoy, avoid a shoal of $3\frac{1}{4}$ fathoms lying 350 yards southeastward of Stickskär Light, by keeping more to the eastward.

Spårö Beacon, in line with Stickskär Lighthouse, bearing 246° , leads 1,200 yards northwestward of Finnkullen; when nearing Norra Båden, open the mark to the southward a little to give that shoal a wider berth and then steer for Stångskär Cairn Beacon; when Idö

Sund opens proceed as before directed, or with the assistance of a pilot, to Vestervik.

Spårö and Stickskär Lights in line, bearing 238° , lead between Syningsknallen and Långgrund; farther in the same course leads close southeastward of a shoal of $4\frac{1}{2}$ fathoms, and also southeastward of Södra Permattsbåden, with 6 feet on it, lying a long mile northward of Idö, and marked by a black spar buoy with ball on the eastern and a red spar buoy with broom on the southwestern side. Norra Båden is left to port, but near this shoal two patches of 22 feet are passed over or very near. After passing Norra Båden Spar Buoy with cross, turn two points to starboard, and when Idö Sund opens, follow the previous directions.

Local magnetic disturbance.—An area of local magnetic disturbance extends along this part of the coast of Sweden. See Caution in Chapter I and index chart.

Vestervik (Västervik), situated on the western side of the entrance to Gamlebyviken, about $4\frac{1}{2}$ miles northwestward of Idö Sund, is a thriving town with about 8,000 inhabitants, and has a good harbor.

Navigable depths.—Vessels of 18 feet draft may proceed to Vestervik and anchor in a depth of from 5 to 7 fathoms in the harbor. The navigation of the port is generally open for steamers all the year round. The other ports in the district are generally closed by ice from the latter half of December to the beginning of April. In Lilla Blockholm Sund, the narrow channel about a mile eastward of Vestervik, the depth is $19\frac{1}{2}$ feet at mean level. There are about 2,500 feet of quayage, with depths alongside of $6\frac{1}{2}$ to $7\frac{1}{4}$ feet at mean water level. Two of the quays have railway lines.

The greatest difference in the water levels may amount to nearly 5 feet with gales from northeast and west. With a continuance of easterly winds a low-water level often occurs.

Communication takes place by steamers with Stockholm and Göteborg, also with places between.

There is communication by railway, telegraph, and telephone.

Coal.—A small quantity of coal can be obtained at Vestervik (Västervik); it is brought alongside vessels in lighters.

Supplies.—Provisions can be obtained; water is supplied by water boat.

Trade.—Exports consist chiefly of iron, iron ore, wood, stone, and matches; imports are coal and coke, manure, aspen wood, and iron goods. Vestervik is noted for its joineries.

Patent slip.—See Appendix I.

Repairs to hull, and small repairs to machinery can be effected at a shipbuilding yard.

Pilots.—Vessels arriving obtain their pilots at Idö Sund, and those leaving, from the pilot office in the town.

Harbor Regulations.—Vessels entering must show their colors until after the customs examination, and anchor in such a manner as to leave the channels clear for traffic.

All vessels except men-of-war, and especially exempted vessels, must report to the harbor master, who will appoint a berth if required, and this berth may not be shifted without permission, but the vessel must move if required to do so by the harbor master.

Vessels at anchor and alongside must always have sufficient men on board to move the ship if required.

Fenders must be provided when alongside, and anchors hoisted in, yards braced up, jibbooms rigged in, and all precaution taken to prevent damage to the quays or piers.

No warps may be laid out without permission, in which case a proper watch must be kept on them.

Speed must be reduced when passing loaded lighters, repair vessels, or opening bridges, so as to prevent damage, and when going alongside speed must not be greater than necessary for maneuvering.

When lying at the piers or quays the engines must not be worked except to turn around, and then as little as possible.

Signaling with steam whistle, etc., is prohibited, except for avoiding danger.

Further details will be found in the published pamphlet which should be obtained on arrival.

Gamlebyviken extends 13 miles in a northwesterly direction from Vestervik, and is connected with Vestervik Fjärd by Stegeholm Canal. The navigation of Gamlebyviken presents no difficulty when the buoys are laid out.

Stegeholm Canal, connecting Vestervik Fjärd with Gamlebyviken, is 49 feet wide, with a depth of 19½ feet at mean water level, and is crossed by a swing bridge.

For the guidance of traffic through the canal, the following signals, made with black balls, are hoisted on a signal mast on the northwestern side of the canal.

One ball signifies canal clear, no current worth mentioning. Two balls signify current in canal setting from Gamlebyviken. Three balls signify current in canal setting toward Gamlebyviken.

If the canal is not clear for navigation, no balls will be hoisted.

Almvik, situated at the head of a bay on the western side of Gamlebyviken, has depths of from 8 to 11 fathoms in the anchorage, over mud and clay. A short pier has a depth of 13 feet alongside. Vessels that can enter Vestervik can reach Almvik.

Pilots.—See Vestervik (Västervik).

Communication.—Steamboats run to Vestervik and Gamleby; there is railway, telephonic, and telegraphic communication.

Gamleby, at the northern end of Gamlebyviken, has from 34 to 11½ fathoms at the anchorage, mud bottom.

A pier, 238 yards long, has a depth of 19½ feet at the southern end, at mean water level, and 9¾ feet at the northern part. There are two cranes with a lifting power of one ton. Another pier nearer the town has a length of 33 yards, with 16 feet alongside. Vessels that can enter Vestervik can reach Gamleby.

Communication is maintained by steam vessel with Vestervik, Valdemarsvik, and Stockholm; there is also railway, telegraphic, and telephonic communication.

Trade.—Exports are wood and stone; imports, coal and manure.

Pilots.—See Vestervik (Västervik).

Gränsö Canal.—A canal 33 feet wide and 5¾ feet deep is cut through the isthmus separating the north end of Lucerna Fjärd from Gudinge Fjärd. A bridge over the canal has an opening 18½ feet wide. A pole beacon stands at the north entrance, on the western side, and a similar beacon at the south entrance on the east side; fixed green lights are shown from these two beacons, from the opening of navigation to May 16 and from August 1 to the close of navigation.

The coast from Spärö to Häradskär, 27 miles northward of it, is intersected by numerous fjärds. The coast and the islands are densely wooded, but there are few conspicuous natural objects or landmarks by which a vessel's position could be ascertained.

Helgenäs, situated at the northern end of Syrsan, a continuation northward of Gudinge Fjärd, has a depth of 16 feet at the anchorage, over mud; farther out there is considerably more water. A pier, with 10¾ feet alongside, has railway lines run to it from Eds Bruk, more than a mile off; there is a small crane.

Bårlösen, forming the entrance to Syrsan, determines the draft, 16 feet, which can come from Idö. From Stedsholm, vessels of 10½ feet draft can enter by Rågö Djupet and northward of Björkö.

A shoal of 2½ fathoms is situated on the pecked line track in Gudinge Fjärd from Idö Sund to Syrsan, about 1 mile 334° from the north point of Vidö.

In Syrsan the greatest difference in the water level is 2 feet; high water occurs with long-continued winds from west to northwest; low water, with similar winds from east to southeast.

Pilots are necessary for those not locally acquainted, and may be obtained from Idö Sund or Stedsholm.

Supplies.—Water and a small quantity of provisions can be procured.

Trade.—Wood and wood pulp are exported, and some coal is imported.

Storkläppen, situated about 8 miles northward of Idö, is the southernmost of the skerries at the southern entrance to Stedsholm, and has a lighthouse on it.

Light.—On Storkläppen, from a square wooden tower, painted in black and white checkers, 49 feet in height, at an elevation of 67 feet above the sea, a flashing white light is exhibited, visible 14 miles.

Storbådan—Buoy.—About $\frac{1}{4}$ mile southward of Storkläppen there is a rock nearly awash, named Storbådan, marked by a red spar buoy, with upturned broom.

Bacon—Tärnkullen, the northernmost rock of the skerries extending from Stedsholm, is rounded, 38 feet high, and has on it a pole beacon, 39 feet high, with stays, and surmounted by a white cross.

Bredgrunden, situated from 1 to $1\frac{1}{4}$ miles southward of Storkläppen, in the entrance of the channel leading to Stedsholm, consists of three shoals; there is a depth of 6 feet on the southernmost shoal; the middle one is awash; and there are 10 feet on the northernmost. The two southern shoals are called Stora Bredgrund, and the northern shoal Inre Bredgrund.

Buoys.—The southern shoal of Bredgrunden is marked on its eastern side by a black spar buoy with ball; the northern shoal is marked on its western side by a red spar buoy with up-turned broom over a ball.

Clearing mark.—Storkläppen Lighthouse in line with the highest part of Vindåsen, bearing 333° , leads eastward of Bredgrunden and of the $4\frac{1}{2}$ -fathoms patch northeastward of the middle shoal.

Stedsholm (Städsholmen) — Pilots.—Stedsholm (Städsholmen), situated $1\frac{1}{2}$ miles north-northwestward from Storkläppen, is a pilot station; pilots attend there and meet vessels outside the shoals, and also in the channel inside the island. They have a decked boat.

Directions.—Stedsholm has two entrances from seaward, both having sufficient depth of water for ships of the largest size; the southern lies between Storkläppen and Bredgrunden Shoals 1 mile southward of it. Approaching this entrance from the southeastward, steer for Storkläppen on a northwesterly course, and bring it under the highest part of Vindåsen, bearing 333° , which leads eastward of the Bredgrunden, as well as of the $4\frac{1}{2}$ -fathom shoal northeastward of them, leave the light on the starboard hand at 600 yards distance at least, to avoid Storbåden, and when Tärnkullen Beacon is well open eastward of Storkläppen the shoal is passed, when a vessel may wait for a pilot in the roomy fjärd southwestward of Storkläppen.

From this entrance, south of Storbådan, a channel leads into Rågö Djupet $3\frac{1}{2}$ miles in a northwesterly direction, thence to Gudinge

and Syrsan Fjärds; there is another channel which leads in a northerly direction to Loftahammar 4 miles northwestward of Stedsholm, and vessels of 10 feet draft can proceed into Loftahammar Bay.

Hasselö, a dark, wooded island, is conspicuous from the eastward.

The northern entrance to Stedsholm (Städsholmen) should be approached by steering 259° , for Tärnkullen Beacon, outside which a pilot must be waited for, his assistance being indispensable to a stranger.

Anchorage.—Inside Stedsholm good anchorage may be obtained in a depth of 6 or 7 fathoms, clay, but the accommodation is limited.

Stapelgrund, with $2\frac{3}{4}$ fathoms on it, lies $2\frac{1}{4}$ miles 30° from Tärnkullen Beacon. Numerous other shoals lie eastward of Vindåsen.

Söderbådan—Buoy.—Söderbådan, consisting of two heads of 1 and $2\frac{1}{2}$ fathoms, situated about 4 miles northeastward of Stedsholm and close southeastward of Norrbådan, with a depth of 5 feet, is marked on its eastern side by a black and white spar buoy, surmounted by a ball.

Shoals.—Blacken, awash, and surrounded by several shoals, lies about 4 miles northeastward of Vindåsen; Innergrund, with $4\frac{3}{4}$ fathoms, lies about 4 miles south-southeastward of Orskär and $3\frac{1}{2}$ miles eastward of Stora Askö; Skallen, a shoal of $1\frac{1}{2}$ fathoms, lies $1\frac{1}{2}$ miles northward of Innergrund and $2\frac{3}{4}$ miles from Orskär. It is intended to moor a black and white spar buoy with ball on the northeastern side of Skallen.

Melstapeln—Buoy.—Melstapeln, a shoal with 1 fathom on it, situated nearly 2 miles 123° from Orskär Beacon, is marked on its southeastern side by a black and white spar buoy with two balls.

Clearing mark.—Häradskär Light, bearing nothing eastward of 7° , leads eastward of the above-mentioned shoals northward of Storkläppen.

Röskärsgrund, awash, is the northern part of a rocky shoal on the southern side of the northern entrance to Bokö. It is an extension eastward of the shoal on which Röskären, the rocks northward of Orskär, are situated. Between it and Melstapeln is Kläbbgrund, awash.

Clearing mark.—Kalen, an islet, lying $2\frac{1}{2}$ miles 255° from Häradskär Lighthouse, in line with a conspicuous house on the western side of Kettilö, bearing 346° , leads eastward of Melstapeln and Röskärsgrund.

Nygrund—Buoy.—Nygrund, with $2\frac{1}{4}$ fathoms over it, lies 2 miles 213° from Häradskär Lighthouse and is marked on its northeastern side by a black spar buoy with ball.

Vienkär (Vieskär) is situated 8 miles northward of Stedsholm (Städsholmen) and $\frac{3}{4}$ mile eastward of Torrö. The eastern approach

to the channel leading between Torrö and Stora Askö, a large island a short distance southward of it, lies close to the southern side of Vienkär and is available for vessels of $17\frac{1}{2}$ feet draft at mean water level. A pilot is necessary.

Skeppsgården, on the western side of Edsviken, about 6 miles westward of Vienkär (Vieskär), has from $3\frac{3}{4}$ to 6 fathoms at the anchorage, over mud. A pier, 59 feet long, has a depth of 16 feet alongside at mean level and $1\frac{1}{2}$ feet less at low level. Vessels of $14\frac{1}{2}$ feet draft can enter, both from Stedsholm and Häradsjär.

The greatest difference in the water level may amount to $3\frac{1}{2}$ feet. High water occurs with gales between north and east and with long-continued winds between west and northwest; low water, with gales between southwest and west-northwest and with long-continued winds between east and southeast.

Pilots can be obtained at Stedsholm or Häradsjär.

Supplies.—A small quantity of water and provisions can be obtained.

The export trade of the place is insignificant and consists of grain and wood.

Orskär (Örskär)—**Beacon.**—Orskär (Örskär), situated $2\frac{1}{2}$ miles north-northeastward of Vieskär, has on it a white stone cairn beacon, 12 feet high, with red horizontal band in the middle; this beacon marks the south entrances to Valdemars Viken and Bokö.

Valdemars Viken, northwestward of Orskär, is a narrow inlet extending northwestward $10\frac{1}{2}$ miles from the entrance between Ovädö (Qvädö) and the islets southward from Bokö; the inner part is remarkably free from shoals. Kreksmålaströmmen, $4\frac{1}{2}$ miles from the head of the inlet, is marked on the northeastern side by two red spar broom buoys and on the southwestern by two black and white spar buoys; the channel between the buoys is available for vessels of $13\frac{3}{4}$ feet draft at mean level.

The greatest difference in the water level is about $3\frac{1}{2}$ feet, with gales from north to east, and from southwest to west-northwest.

Valdemarsvik, at the head of Valdemars Viken, has a depth of 21 feet, over mud and clay, in the harbor. Two small piers have $14\frac{3}{4}$ feet alongside; the north quay, 380 yards long, with $14\frac{3}{4}$ feet alongside, and the south quay, 372 yards long, has a depth of 13 feet. Wood is shipped. Vessels of $13\frac{3}{4}$ feet draft can enter at mean level.

Pilots are obtained from Stedsholm or Häradsjär; outgoing vessels from the latter place.

Communication takes place by steamer with Stockholm, Norrköping, and Vestervik. There is a railway and telegraph and telephone facilities.

Supplies.—Water and provisions can be had, also a few ships' stores.

Bokö is a small island in the channel leading northward from the entrance to Valdemars Viken. Bokö Harbor has depths of 6 to 8 fathoms abreast the village on the southeastern side of the island, but it is narrow and the holding ground indifferent. There is better anchorage on the northeastern side of Bokö, where the bottom consists of clay.

Entrances.—There are two entrances to Bokö: the southern passes southwest of Melstapeln and westward of Orskär Beacon; the northern passes northward of Karten. A white ring on the steep slope at the south part of Stora Lökskär, close eastward of Bokö, open southward of a house on Bokö, the length of the house, bearing 284° , leads between the outer shoals of the northern entrance.

A pilot is necessary for both entrances, and is obtained from Häradsjär. The skerry channel from Bokö to Stedsöholm can be navigated by vessels of $16\frac{1}{4}$ feet draft, and that from Bokö to Kettilö by those of $18\frac{3}{4}$ feet at mean level.

Häradsjär Light.—On the southern extremity of Häradsjär, at $5\frac{1}{2}$ miles east-northeastward of Bokö, stands a red, circular iron tower, 96 feet high, from which, at an elevation of 119 feet above the sea, is exhibited a fixed and flashing white light visible 17 miles. (For details see Light List.)

Pilots.—Häradsjär is a pilot station; pilots attend there and at the north point of Kettilö, an island 4 miles northwestward of Häradsjär. They meet vessels outside the shoals in a decked boat, and also in the channel north of Kettilö.

Barö Sund is one of the most frequented channels along the coast of East Gotland Province; the southern entrance lies between the skerries on the west side of Häradsjär, and is used by vessels bound from the south to Söderköping and the Götha Canal.

Navigable depths.—The channels between Barö Sund and Arkö can be navigated by vessels drawing 23 feet; and to Ettersund in the outer part of Slätbakan by those drawing 16 feet.

Beacons.—Flatskär Beacon, $3\frac{1}{4}$ miles westward of Häradsjär, has a colored horizontal band.

On a rock close south-southeastward of the east point of Kettilö is a white pole beacon, 16 feet high, with a square topmark, diagonal in line with pole, and the stays covered in with boards.

Dangers in approach.—Western side of southern approach.

Kalsgrunden, lying between Nygrund and Kalen Islet, is marked on the eastern side by a black and white spar buoy.

A shoal of $2\frac{3}{4}$ fathoms lying over $1\frac{1}{2}$ miles 266° from Häradsjär Lighthouse, is marked on the eastern side by a black and white spar buoy.

A patch of $3\frac{1}{4}$ fathoms lies about 800 yards south of Sandö Light.

Eastern side of southern approach.—**Buoys**—**Ljusgrund**, with $3\frac{1}{4}$ fathoms over it, lies $1\frac{1}{4}$ miles 121° from Härede Light-house. It is marked on the eastern side by a black buoy with a white band carrying a ball topmark. A patch of 6 fathoms lies $\frac{1}{4}$ mile north of Ljusgrund.

Kuggskärgrund, with $2\frac{1}{4}$ fathoms on it, lies about $\frac{3}{4}$ mile south-westward from Härede Light-house and is marked by a red broom buoy on the southwestern and a black and white spar buoy on the northeastern side. Gjörviksgrund, a shoal of $4\frac{1}{4}$ fathoms, southwestward of Kuggskärgrund, extends close to the leading mark up to Barö Sund.

A shoal on which the sea breaks, lying $\frac{3}{4}$ mile northwestward of Kuggskärgrund, is marked in the same manner as that shoal.

A shoal, stated to have more than 6 feet on it lies $\frac{3}{4}$ mile north-northwestward from the last-mentioned shoal and 1 mile 155° from Sandö Light, and is marked on the western side by a red broom buoy.

Lights.—**Sandö Light**, situated 2.7 miles northwestward from Härede Light, is exhibited from a white octagonal lighthouse, on the south point of the island, and elevated 30 feet above the sea; it is group flashing, with white, red, and green sectors. The white, red, and green lights are visible 11, 8, and 7 miles, respectively. The light is unwatched. (For details see Light List.)

Qvarnholmen (Kvarnholmen) Light, in a similar structure on the southernmost islet, situated $2\frac{1}{4}$ miles north-northwestward from Sandö, is group occulting, with white, green, and red sectors, elevated 10 feet above the sea. The white, red, and green lights are visible 6, 4, and 3 miles, respectively, in clear weather. The light is unwatched. (For details see Light List.)

Gråholmen Light, in a similar structure on the easternmost islet, nearly a mile northward of Qvarnholmen Light, is occulting, elevated 26 feet above the sea, and shows white, red, and green sectors. The white light is visible 6 miles and the red and green lights 4 and 3 miles, respectively. The light is unwatched. (For details see Light List.)

Qvarnholmen and Gråholmen Lights are exhibited from July 6 to June 6; Sandö Light throughout the year.

Anchorage may be obtained in Barö Sund, about 3 miles north-westward from Härede Light, inside Barnsö and Sandö, between these and Fängö, in a depth of from $5\frac{1}{2}$ to 10 fathoms, clay and rock.

Directions.—The entrance to Barö Sund can be used by vessels of deep draft.

From the southward, approach Härede Light-house between the bearings of 334° and 7° , and when Orskär Beacon bears about 259° ,

the houses at Barö Sund custom station, on the eastern point of Kettilö, should be seen if the weather is tolerably clear. Bring the large customhouse or the pole beacon previously mentioned over the middle of the sund between Barnsö and Sandö, bearing 336° , which mark leads toward the sund, passing eastward of Nygrund and between the shoals previously described. The $3\frac{1}{2}$ -fathom patch southward of Sandö may be avoided by steering a little to starboard. Steer through in mid-channel between Barnsö and Sandö to the anchorage described above.

From the eastward Kalen, bearing 265° , open well southward of the Häradskär Group, leads southward of all the dangers eastward of the light; Kalen, touching the south side of the group, leads among the shoals. Pass from 600 to 800 yards southward of Häradskär Lighthouse and steer more northerly to pass between Kuggskärsgrund on the port hand and a shoal marked by two red spar-buoys with upturned brooms on the starboard hand, situated southward of a low yellow rock named Kuggskär. When the customhouse comes in line with the middle of the sund between Barnsö and Sandö, proceed as previously directed.

At night the sector of group flashing white light from Sandö leads to the entrance of the sund between Barnsö and Sandö, but the eastern edge of the sector passes over the $4\frac{1}{2}$ -fathom shoal previously mentioned.

Gryt, westward of Kettilö, on the small bay named Årsviken, northward of Gryt Church, has $3\frac{1}{2}$ fathoms at the anchorage, with $1\frac{1}{2}$ feet less at low-water level. A pier 62 feet long has $10\frac{1}{2}$ feet alongside. Vessels of $19\frac{1}{2}$ feet draft can enter. A few provisions may be had. Wood is shipped.

Pilots are obtained from Häradskär.

Communication by steamer takes place with Stockholm, Norrköping, Valdemarsvik, and Vestervik; there are telephone facilities.

Strandviken, in Rankel Sund, which extends westward from Orr Fjärd about $5\frac{3}{4}$ miles northwestward of Gryt Church, has anchorage in $5\frac{1}{2}$ fathoms, clay.

A pier 92 feet long has 11 feet alongside at mean water level and $9\frac{1}{2}$ feet at low level. Wood is shipped.

Vessels of deep draft can approach the anchorage. Vessels from sea obtain pilots at Häradskär, and those leaving, from the north point of Kettilö.

Communication by steamer takes place with Norrköping and Valdemarsvik.

Gropviken, about $8\frac{1}{2}$ miles northward of Valdemarsvik, is an inlet extending west-northwestward from Finn Fjärd. At the anchorage the depth is about 6 fathoms, clay. There are four stone piers, from 72 to 102 feet in length, of which the two outermost have $9\frac{3}{4}$ feet

and the others $8\frac{1}{2}$ feet alongside, with $1\frac{1}{2}$ feet less at low-water level. Wood is shipped. Deep-draft vessels can enter.

Slätbaken Fjärd extends 11 miles in a westerly direction to Mem at the entrance of Götha Canal, and is accessible to vessels that can pass through Etter Sund.

The most important parts on the northern side of the channel are marked by red spar buoys with broom topmarks, and the southern side with black and white spar buoys. Vessels clear at the customhouse at Mem for passing through the canal.

Etter Sund, about $8\frac{1}{4}$ miles eastward of Mem, can be passed through by vessels of $14\frac{1}{4}$ feet draft at mean water level and 13 feet draft at low level.

Lights.—A light showing red on the port side and green on the starboard, both going in and coming out, is shown from each of two dolphins, one on the south side of the eastern entrance and the other on the north side of the western entrance; they are unwatched and are extinguished between June 6 and July 6, but their lighting may sometimes be delayed on account of the strong current in the sund.

Stegeborgsund, about 2 miles westward of Etter Sund, can be passed by vessels that can navigate the latter, there being about 1 foot more water. Two red broom buoys mark the north side of the channel and two black and white spar buoys the south side, the outer one of the latter lying eastward of the entrance. As the current is frequently very strong, two warping buoys are moored on the southern side of the sund.

Light.—On the southern side of the channel an unwatched light is exhibited, showing red eastward and green westward; extinguished from June 6 to July 6.

Mem, situated at the inner end of Slätbaken Fjärd, on the northern side of the entrance to the Götha Canal, has anchorage off it in from $3\frac{1}{4}$ to $6\frac{1}{2}$ fathoms, clay. A pier, 62 feet long, has $14\frac{1}{4}$ feet alongside at mean water level and 2 feet less at low level; in the canal entrance outside the lock, a stone quay 350 feet long, has $9\frac{1}{4}$ feet alongside at low level, and above the lock, at a basin in the canal, there is a quay 393 feet long. Vessels passing through the lock to load at the last-named quay do not pay canal dues, but harbor dues only. At Killingholm, $\frac{1}{2}$ mile eastward of Mem, there is a pier 85 feet long, with $14\frac{1}{4}$ feet alongside at mean level; vessels arriving with aspen wood from Russian ports, and generally those laden with coal, discharge at Killingholm.

Vessels loading wood at Mem and drawing more than $14\frac{1}{4}$ feet generally complete their loading outside Etter Sund.

Navigation generally opens about the middle of April and closes about the beginning of December.

Vessels from Häradskär take either the route through Lagnö Sund, between the mainland and N. Finnö and Yxnö, which, however, has only depth sufficient for vessels of 9½ feet draft at mean level, or that through the skerry channel to Aspö Fjärd, 3 miles southward of Arkö, and then westward to Slätbaken, which route is available for vessels of 16 feet draft at mean level.

Light.—A fixed red light, elevated 13 feet above the sea, is exhibited from a white square tower on the north pier, outside the canal lock entrance. It is only lighted when the canal is open for traffic.

Pilots.—Mem is a pilot station; vessels from sea obtain their pilots at Häradskär and Arkö; those leaving at Mem by day only.

Supplies.—Provisions, water, and a small quantity of coal can be obtained.

Trade.—Sawn wood is exported, and aspen wood imported.

Communication by steamer takes place with Stockholm, Göteborg, and places on the canal between, also the towns on lakes Roxen, Vettern, and Vänern. There are telegraph and telephone facilities.

Söderköping is a very old town, situated on the southern side of the canal, 3 miles from Mem, and contains about 2,000 inhabitants. At the quay there is room for three small vessels. Supplies for shipping are scanty. At Klefbrinkan, ¾ mile inside Söderköping lock, is a basin with room for six canal craft. There is communication by railway, telegraph, and telephone.

Götha (Göta) Canal.—The total distance from the Kattegat to the Baltic, by this canal and its connections, is about 110 nautical miles. The artificial canal, about 48 nautical miles in length, is 47 feet wide at the bottom, 86 feet on the surface, and 9¾ feet in depth.

The locks are each 116¾ feet long, 23½ feet wide, and 9¾ feet deep over sills. There are in all 58 locks, four of which are used for regulating the water level. The width of the lock at Mem is 23¾ feet.

The dimensions of the largest vessels that can navigate the canal are 105 feet long, 21½ feet beam, and 9 feet draft, or of about 165 tons. About 30 bridges cross the canal, all opening to permit vessels to pass. The highest point of the navigation is in Lake Viken, about 300 feet above the sea. The passage of the canal takes about 2½ days, the speed of steamers being 4 to 5 knots in the canal and 7 to 9 knots in the lakes.

Steamers leave Göteborg (Göthenburg) for Stockholm by the canal Tuesday, Thursday, and Saturday evenings during the season of navigation.

Norrköping Bight lies between Häradskär and Landsort or Öja, 45 miles northeastward of it; from this bight there are several channels leading between the skerries into Slätbaken and Brä Viken Fjärds. Between Häradskär and Arkö, 20 miles northward, there are no safe inlets from seaward; there are, however, several inner channels leading to Söderköping and other anchorages, but they should not be attempted without a pilot or local knowledge. The mainland between Valdemars Viken and Slätbaken is generally not sufficiently high to be seen over the numerous islands and skerries which front the coast, and extend, in some parts, more than 12 miles seaward.

Vikboland, the peninsula between Slätbaken Fjärd and Brä Viken, is high and wooded, especially in the south part; Lönshufvud, $4\frac{1}{2}$ miles southwest from Arkö, is precipitous, and can be seen from a considerable distance seaward.

Gubbö—Beacon.—An old cairn, unpainted, and 13 feet high, stands on a hill 98 feet in height on the southern side of the Gubbö, an island in the Skärgård, 3 miles 348° from Häradskär Lighthouse.

Off-lying dangers—Buoys—Vikasgrunden, lying from $7\frac{1}{2}$ to $8\frac{1}{2}$ miles northeastward of Häradskär Lighthouse, comprise a number of shoals, the least depth on one of them being 1 fathom; a black and white spar buoy with two balls is moored eastward of the southern shoal, the depth on which is $3\frac{1}{4}$ fathoms.

Clearing mark.—Häradskär Light bearing 237° leads southeastward of Vikasgrunden and of the patch of $5\frac{1}{2}$ fathoms, lying 1,200 yards to the southward.

Sankbaden (Sänkbåden), lying about 1 mile south-southeastward from Sandsänkan, has $2\frac{1}{4}$ fathoms on it, and is marked on its southeastern side by a black and white spar buoy with one ball. There are several shoals around with more water on them.

Clearing mark.—Sandsänkan bearing 315° leads northeastward of Sankbaden.

Sandsänkan, the outermost skerry abreast Slätbaken Fjärd, is a small, low, bare islet, surrounded by shoals, situated 11.3 miles 30° from Häradskär Lighthouse.

Juliabåden.—A $3\frac{1}{4}$ fathoms shoal is located $1\frac{3}{4}$ miles north-northeastward of Sandsänkan. A black spar buoy with white band is moored on its eastern side.

Klacken, situated 4 miles northward of Sandsänkan, is a shoal with $2\frac{1}{2}$ fathoms water over it, marked by a black and white spar buoy, surmounted by a ball.

Gränsögrundet, with $4\frac{1}{2}$ fathoms water, and 14 to 20 fathoms close around, lies 6.3 miles 5° from Sandsänkan, and consists of several detached rocks. From Gränsögrundet, Arkö Beacon bears 307° , distant 7.7 miles.

Norra Fällbådan, awash, and with shoals of $3\frac{3}{4}$ to $4\frac{1}{4}$ fathoms around, lies with Arkö Beacon bearing 310° , distant $4\frac{1}{4}$ miles. A black buoy surmounted by two balls is moored on the northeastern side of this shoal.

Arköbådan, situated about $7\frac{1}{2}$ miles 99° from Arkö Beacon, comprises three shoals of 5 feet, $2\frac{1}{2}$ and $3\frac{1}{4}$ fathoms; a red spar buoy with two balls under an up-turned broom is moored on the southeastern edge of Arköbådan.

A shoal of 1 fathom lies 1,400 yards northward and one of $2\frac{1}{2}$ fathoms lies nearly $1\frac{1}{4}$ miles north-northeastward from Arköbådan Buoy.

About $2\frac{1}{4}$ miles eastward of this grund lies a shoal with $3\frac{3}{4}$ fathoms and a depth of 11 to 19 fathoms around.

Clearing marks.—Arkö Beacon, bearing 287° , just open northward of Svarta Utterklabb Beacon, leads south, and Hafringe Beacon, bearing 15° , leads eastward of Arköbådan and westward of the patch of $3\frac{3}{4}$ fathoms. At night Hafringe fixed white light in sight leads eastward of Arköbådan. Hafringe Beacon bearing 0° leads eastward of the $3\frac{3}{4}$ -fathom patch.

Sörbobrotten, a large tract of foul ground, several parts of which are awash, extends northwestward from Arköbådan toward the skärgård.

Stångskarsgrund, with a least depth of $\frac{3}{4}$ fathom over it, situated north-northeastward, distant about 4 miles from Arköbådan, has a black and white spar buoy, surmounted by two balls, moored off its southeastern side.

A shoal, with $5\frac{1}{4}$ fathoms least water, lies $\frac{3}{4}$ mile south-southeastward from the buoy of Stångskarsgrund.

Clearing marks.—Hafringe Beacon bearing 5° , or Hafringe fixed white light in sight, leads eastward of these two shoals and $\frac{3}{4}$ mile westward of the $3\frac{1}{4}$ -fathom shoal 2 miles eastward of Stångskarsgrund.

A $3\frac{1}{4}$ -fathom shoal, marked on its eastern side by a black buoy with a white horizontal band and a spherical topmark, lies 2 miles eastward of Stångskarsgrund.

Arkö, which is separated from the eastern extremity of Vikboland by Arkö Sund, is $1\frac{1}{2}$ miles long north and south and of a similar breadth. On the southwestern point of the island is a high, two-storied pilots' lookout house, white toward the sea, and visible from a considerable distance. Southeastward of the lookout house the Arkö fir trees are seen when Arkö Sund is open. There is a small pier at Arkö with $10\frac{1}{4}$ feet alongside at mean level. Water can be obtained.

Beacons—Arkö.—On the eastern part of Arkö stands a triangular pyramidal beacon, 50 feet above the sea, the upper third of the seaward face painted black and the remainder white.

Svarta Utterklabben, a small rock nearly $1\frac{1}{2}$ miles east-south-eastward from Arkö Beacon, has on it a red and white checkered beacon 41 feet high.

Lights—Viskär, the rear leading light for approaching Arkö Sund, is a flashing white light elevated 57 feet above the sea and visible 13 miles. The lighthouse is a white tower on the gable of a red dwelling.

Stora Utterklabben, the front leading light, is a fixed light, with white, red, and green sectors. It is exhibited from a white cylindrical tower at an elevation of 26 feet above the sea and is visible in clear weather, the white light 10 miles, the red and green lights 4 and 3 miles, respectively. This light is unwatched. (For sectors see Light List.)

The above lights in line, bearing 288° , will lead in the northern channel from seaward. They are discontinued when ice prevents navigation.

Kopparholmen Light, on the west point of Stora Kopparholmen, about 1 mile southward of Arkö, is an occulting light, with white and green sectors, exhibited from the gable of a white house, at an elevation of 13 feet above the sea; the white light is visible 6, and the green light 3 miles. The light is shown from July 6 to June 6, and is unwatched. (For details see Light List.)

Svartvitsberget Light, on the south side of Arkö, is a fixed light with white and green sectors, exhibited from the gable of a white house, at an elevation of 35 feet above the sea; the white light is visible 6, and the green light 3 miles. The light is unwatched, and is not shown when Arkö Anchorage is blocked by ice. (For details see Light List.)

In line with Kopparholmen Light it leads through Aspö Fjärd.

Pilots.—Arkö is a pilot station; pilots attend there and at Viskär and meet vessels entering from sea outside the outer shoals in a decked boat; those in the skerry channel are met off the southwest point of Arkö. There is a telephone at the pilot station.

Arkö Entrance leads to Slätbaken Fjärd and Bråviken, and also by way of an outer skärgård channel past Alen, to Oxelö Sund.

The inner part of Slätbaken Fjärd can be entered by vessels drawing $14\frac{3}{4}$ feet at mean water level; Bråviken can be entered by vessels of 18-foot draft at mean level, through Gränsösund, northwest of Arkö; and the channel just mentioned leading to Oxelö Sund, by vessels drawing $11\frac{1}{4}$ feet at mean level.

Two channels, about $1\frac{1}{4}$ miles apart, lead from sea to Arkö; of these the southern is the best, being nearly straight, and available for vessels of deep draft. The northern channel is narrower, and should only be used in fine weather; it has a depth sufficient for vessels

of 23 feet draft at mean level. The northern channel is lighted by two leading lights.

Directions—Southern channel.—When Arkö Beacon is sighted, steer for it between the bearings of 300° and 307° , which will lead northeastward of North Fällbådan. Vessels of heavy draft, or those of less draft in a heavy sea, should avoid the shoals of $4\frac{1}{2}$ and $5\frac{1}{2}$ fathoms lying $\frac{1}{2}$ mile northward of North Fällbådan.

From a position $\frac{1}{4}$ mile northward of N. Fällbådan Buoy, black spar buoy with two balls, steer 291° for the northern end of the eastern Kopparholmen. This course leads close southward of a patch of $4\frac{1}{2}$ fathoms lying nearly $1\frac{1}{4}$ miles 303° from the N. Fällbådan Buoy and passes southward of three red spar buoys, the outer one of which is surmounted by a ball under an upturned broom, and marks a shoal of $3\frac{1}{2}$ fathoms; the center buoy, with upturned broom, is on the southern side of a patch of $2\frac{1}{2}$ fathoms and the inner buoy, with upturned broom over a ball, lies on the southern edge of Galtbrott Shoal.

On the southern side of the channel a black and white spar buoy lies abreast the center red buoy just mentioned and a black spar buoy with ball lies on the northern end of a reef about $\frac{1}{4}$ mile southwestward of the red buoy on Galtbrott. Having passed these buoys, a pilot should be obtained; the remainder of the channel to Arkö is marked by red broom buoys on the northern side and black and white spar buoys on the southern.

Northern Channel.—Approach Arkö Beacon on a course between 285° and 300° and bring it open southward of Svarta Utterklabben Beacon, bearing 294° ; steer toward this mark, and having on the starboard hand Östragrund, with 1 fathom on it, marked by a red spar buoy, with upturned broom over ball, and a 3-fathom shoal, marked by a spar buoy with a cross on its southeastern side, about $\frac{1}{2}$ mile west-southwestward from it; on the port hand a red and black spar buoy with cross, marking a shoal of 3 fathoms, and a black buoy with a spherical top mark, marking a $2\frac{3}{4}$ -fathom shoal, $1\frac{1}{4}$ miles southeastward of it, is passed, and at a greater distance two black spar buoys, each with one ball, the outer one marking Outer Nygrund, a shoal with 11 feet on it, also two black and white spar buoys between the above, marking Inner Nygrund and a shoal north-northwestward of it. Svarta Utterklabben is left 200 yards to starboard, passing over a depth of $4\frac{1}{2}$ fathoms; then steer close northward of the white lighthouse on Stora Utterklabben, passing close to a shoal of $3\frac{1}{2}$ fathoms and between a red broom buoy southward of Gula Utterklabb and a black and white spar buoy on the shoal extending from Utterklabbarne. From the lighthouse the course bends southwestward, and the services of a pilot are necessary.

At night the lights on Viskär and Stora Utterklabben in line bearing 288° leads between the shoals in the northern channel.

Arkö Sund.—At Arkö Sund, between Arkö and Vikboland, on the mainland side, is a pier, 115 feet long, with railway lines laid on it; the depth alongside is $23\frac{1}{2}$ feet at mean water level. With long-continued easterly winds in spring an unusually low water level is often found, as much as 2 feet below the mean level. There are railway, telephone, and telegraph stations; water can be had.

Hafringe (Häfringe) is the largest of the off-lying skerries abreast the entrance to Bråviken; it is bare, moderately high, and surrounded by rocks and shoals, some of which extend nearly 5 miles in an easterly direction.

Beacons.—On the highest part of Hafringe (Häfringe), 36 feet above the sea, stands an hexagonal tower-shaped beacon, with pointed roof, painted red with a broad white band; the beacon is 62 feet high, and can be seen in clear weather from a distance of 14 miles.

Norra Kränkan, a rock situated 2.3 miles east-northeastward of Hafringe Beacon, is marked by a pole beacon with triangular topmark.

Landmarks.—Gullängsberget, a hill on the north shore of Bråviken, $2\frac{3}{4}$ miles westward of Kungshamn, slopes steeply to the sea on its outer and lower part; it may be easily recognized by Hargö, an island with steep north and south sides, lying about 1 mile westward of it.

Kummelberget, a hill 263 feet high, lies $2\frac{1}{4}$ miles northwestward from Gullängsberget.

Dangers—Buoys—Kränkan.—The shoal of 1 fathom, lying $\frac{1}{2}$ mile eastward from Norra Kränkan, situated 2.3 miles east-northeastward of Hafringe Beacon, is marked on its northern side by a black spar buoy with a ball topmark.

N. Aken, with 9 fathoms, and Öst Aken, with 8 fathoms, lie $4\frac{1}{2}$ and $4\frac{3}{4}$ miles, respectively, eastward of Hafringe.

A black buoy with a white band and a staff with two balls has been moored about $3\frac{3}{4}$ miles eastward of Hafringe Lighthouse, on the southeastern side of a $5\frac{1}{2}$ -fathom shoal, which lies 1.7 miles south-eastward of Norra Kränkan Beacon.

The $4\frac{3}{4}$ -fathom shoal, known as Norrgrund, which lies $1\frac{1}{4}$ miles east-southeastward of Norra Kränkan Beacon, is marked on its southeastern side by a black buoy with a white stripe and a staff with one ball.

Grytan Shoal, with a depth of 3 fathoms on it, situated east-southeastward $2\frac{3}{4}$ miles from Hafringe Beacon, is marked on its southern side by a red spar buoy, with a ball under an upturned broom.

Clearing marks.—Gullängsberget well open southward of Lilla Rödbaken, an islet $\frac{1}{2}$ mile southward of Hafringe, bearing 277° , leads southward, and Hargberget bearing nothing north of 355° , leads eastward of all the shoals lying eastward of Hafringe.

Stenen, with 1 fathom on it, and marked by a red spar buoy with upturned broom, lies 1 mile 119° from Hafringe Beacon.

Korpgrund, with $1\frac{1}{2}$ fathoms, marked by a red spar buoy with upturned broom over two balls, lies $\frac{1}{4}$ mile west-northwestward of Stenen. The reef extending southeastward from Karten Rocks, northeastward of Lilla Rödbaken, is marked on the eastern side by a black and white spar buoy.

Häfringe Norrgrund, of small extent, with a depth of 34 fathoms on it, lies northward of the fairway, a short distance west-northwestward of V. Korpen; a broom buoy is moored on its southern edge.

Lights.—A fixed light, with white and red sectors, elevated 51 feet above the sea and visible 13 miles, is exhibited from a red tower attached to a dwelling 35 feet high southeastward of the beacon on Hafringe (Häfringe), during that part of the season when the channels between the islands are not closed by ice. (For sectors see Light List.)

About 43 yards 116° from the above, an occulting white light, elevated 25 feet above the sea, and visible 10 miles in clear weather, is exhibited toward the southeastward from a square tower, painted white on the southeastern side. (For details see Light List.)

On V. Korpen, a rock to the eastward of Hafringe, a group occulting light, with white, red, and green sectors, is exhibited 26 feet above the sea, from a white tower. The white, red, and green lights are visible 6, 4, and 3 miles, respectively; unwatched. (For details see Light List.)

Grässkären.—On the eastern rock of Grässkären, $2\frac{1}{2}$ miles west-northwestward of Hafringe, a group flashing light, with white, red, and green sectors, is exhibited at an elevation of 41 feet above the sea, from a white concrete tower 39 feet high. The white light is visible 12 miles, the red 8, and the green light 7 miles. Unwatched; and unlighted from June 6 to July 6. (For details see Light List.)

Local magnetic disturbance.—An area in which the magnetic conditions are disturbed exists in the vicinity of Hafringe and Oxelö Sund.

Pilots attend at Hafringe, and also at Oxelö Sund, where there is a pilot station, and meet vessels in a decked boat outside the shoals, and also in the channel in Oxelö Sundet. They will conduct vessels to Arkö, Norrköping, Oxelö Sund, Nyköping, Hartzö, Säfö Sund, and other ports and anchorages in the vicinity.

Hafringe (Häfringe) Entrance leads to Bråviken, Oxelö Sunds Hamn and Örsbaken, the Fjärd outside the entrance to Nyköping, with depth sufficient for the heaviest-draft vessels.

Directions.—When approaching the entrance steer a north-westerly course toward Hafringe Beacon, and as soon as Bergö-hufvud, the round hill on the north point of Bergö, eastward of Oxelö Sund, is made out, bring it between Hafringe and V. Korpen, bearing 310° , which leads southwestward of Grytan, Stenen, and Korpgrund, and northeastward of a patch of $4\frac{3}{4}$ fathoms and a black and white spar buoy on the reef extending southeastward from Karten Rocks. When the latter buoy is passed, bring Bergö-hufvud nearer V. Korpen, to avoid the shoal water off Hafringe, marked by a black and white spar buoy; then keep in mid-channel, leaving Häfringe Norrgrund, marked by a broom buoy, to starboard.

Hafringe (Häfringe) Lighthouses in line, bearing 296° , also lead in between the shoals until within $\frac{1}{4}$ mile of the islet, when proceed as above directed.

At night, Hafringe Lights in line, 296° , lead in; also the south-eastern white sector of V. Korpen Light between the bearings 310° and 320° .

With strong onshore winds and a vessel of heavy draft it is better to steer for Hargberget on a 355° course, and when Hafringe Beacon bears 270° , steer 315° until the beacon bears 240° , when steer for it on that bearing, passing northwestward of the shoals eastward of Hafringe and southeastward of a shoal of $2\frac{1}{2}$ fathoms, marked by a red broom buoy, $1\frac{1}{4}$ miles northward of Hafringe. When under the lee of the islets take a pilot on board, avoiding Hafringe Norrgrund, west-northwestward of Korpen.

Anchorage.—Close inside Hafringe there is a small bank of clay with 5 fathoms on it, where vessels can anchor in fine weather.

Bråviken, situated 9 miles northward of Slätbaken Fjärd, extends 25 miles in a westerly direction; the entrance between Arkö and Oxelö, 10 miles north-northeastward from it, is encumbered with numerous islets, rocks, and shoals, and should be approached with caution. Anchorage may be had almost anywhere in the navigable portions of Bråviken.

Beacons.—The two following beacons mark the Skärgård Channel from Arkö to Oxelö Sund, across the entrance to Bråviken. On Logen Island, situated $2\frac{1}{4}$ miles northward of Lundö, on the eastern side of the passage across Bråviken, there is a cairn beacon 10 feet high, painted white with a red horizontal band.

On Alen Island, lying $1\frac{1}{4}$ miles northeastward of Logen, there is a triangular spar beacon, 29 feet high, with a rectangular topmark; the north side of the beacon is painted white, the south side red, with the topmark white.

A 9½-foot shoal is located northward of L. Alen, in the channel between Arkö and Oxelö Sund. This shoal is marked by a spar buoy with a cross as a topmark.

Lights—Kungshamn.—Two lights are exhibited on the skerries on the northern side of the entrance to Bråviken; the eastern light, elevated 59 feet above the sea, shows flashing, with white, red, and green sectors, the white light visible 9 miles, the red 6, and the green 5 miles. It is shown from a white circular iron tower, 29 feet high.

The western light is occulting white, visible 9 miles, and is shown 36 feet above the sea from a white circular building.

These lights are unwatched and are shown from July 6 to June 6. In line they bear 70°. (For details see Light List.)

Kopparbo.—A group occulting light with white, red, and green sectors, elevated 16 feet above the sea, is exhibited from a white tower at Kopparbo on the northern shore of Bråviken, about 9 miles east-northeastward from Norrköping. The white, red, and green lights are visible 6, 4, and 3 miles, respectively. The light is unwatched. (For details see Light List.)

Stora Juten.—An occulting light, with white, red, and green sectors, elevated 21 feet above the sea, is exhibited from a white house on a wooden framework situated on Stora Juten, a rock outside Pampus. The white, red, and green lights are visible 8, 5, and 3 miles, respectively. The light is unwatched. (For details see Light List.)

Lights are also shown on Marö, Ekö, and Västra Ramsholmen Islands in the southern part of Bråviken, also on the north coast of Lönö. (For details see Light List.)

The above lights are shown from July 6 to June 6.

Black light-buoys with fixed white lights are moored off Fläsköar and Gränsö, a red buoy with fixed green light off Fläsköar, and a red buoy with topmark, showing a fixed white light, off Anholm.

When necessary on account of ice, Gränsö and Fläsköar North Lightbuoys will be replaced by plain marks, Anholm and Fläsköar South Lightbuoys by broom marks.

Norrköping Entrance.—A fixed red light is shown from a dolphin on the southern side of outer end of the dredged channel to Norrköping.

An alternating white and green light is shown on Lösingskär, northern side of channel, about 800 yards westward of the dolphin just mentioned; unwatched.

A flashing white light is shown on Hvitskär, southern side of channel, about 1.7 miles westward of Lösingskär; unwatched.

The channel to Norrköping is marked by fixed green lights on dolphins on the starboard hand entering and fixed red lights on the port hand.

The lights in Norrköping Entrance are shown from July 6 to June 6.

A light-buoy, showing a fixed green light, lies on the northern side of the channel opposite Hvitskär Light.

Näfveqvarne, on the north shore of Bråviken, about 17 miles from Hafringe, has a depth of $5\frac{1}{2}$ fathoms, mud, at the anchorage, which can be reached by vessels of the deepest draft. A pier, 138 feet long, has $13\frac{1}{4}$ feet alongside at mean water level and 12 feet at low level.

Light.—A flashing light, with white, red, and green sectors, is exhibited, 25 feet above the sea, from a white octagonal iron house on the point eastward of Näfveqvarne. The white light is visible 9, the red light 6, and the green 5 miles.

Communication by steamer takes place with Norrköping, Oxelö Sund, Nyköping, and Stockholm. There are telephone facilities.

Trade.—Exports consist of wrought iron and castings; imports iron, coal, and coke.

Sandviken, on the northern side of Bråviken, about 10 miles from Norrköping, has a depth of 11 fathoms, clay, at the anchorage, which can be reached by the deepest draft vessels from Hafringe, and by those of $17\frac{1}{4}$ feet from Arkö. A pier, 102 feet long and 39 feet broad, and a quay, 115 feet in length, have from $7\frac{1}{2}$ to 13 feet alongside at mean water level. There is a small crane. A tug is available.

Communication by steamer with Norrköping takes place several times daily. There are telephone facilities.

Trade.—Exports are wood and iron; coal is imported.

Djurö Hamn.—From the western point of Djurö, on the southern side of Bråviken, a pier extends about 164 yards northwestward. The passage between the island and the small rock westward of the point is dredged, and there is a depth of $24\frac{1}{2}$ feet on the west side of the pier and 18 feet on the east side at mean level. In the harbor are moorings and rings in the rocks for securing vessels. There is a grain elevator. A steam post-boat runs daily to Norrköping, and there is telephonic communication.

Buoys.—The channel between Stora Juten and Djurö is marked on the western side by a red broom buoy and on the eastern by two black and white spar buoys. Four black and white spar buoys in the harbor mark the western edge of the dredged channel.

Norrköping stands about 5 miles from the mouth of Motala River, which empties itself into the head of Bråviken; it has cloth and paper factories and cotton mills, and contains about 46,180 inhabitants (1914).

There are four hospitals and a sailors' home.

Channel—Harbor.—The narrow and winding dredged channel leading to the town is marked by dolphins and spar buoys, and will

admit vessels of $18\frac{1}{2}$ feet draft; the depth in the dredged channel and in the greater part of the harbor is $19\frac{1}{2}$ feet at mean water level. The bottom of the river is generally clay, with rock in a few places. There are 3,357 yards of quay, of which there are 273 yards with $19\frac{1}{2}$ feet alongside, 2,460 yards with $17\frac{1}{4}$ feet, and 623 yards with 15 feet, all at mean level. Alongside the new south quay there is water sufficient for a vessel of 22 feet draft. There are 11 cranes of from 2 to 12 tons, 6 of which are electric and 2 steam floating cranes.

Navigation is open throughout the year for steamers, with the assistance of an ice breaker in winter.

Water level.—The greatest difference in water level is $5\frac{1}{4}$ feet ($3\frac{1}{4}$ feet above and 2 feet below mean level). The highest level occurs with easterly and the lowest with westerly gales, between November and April.

Communication.—The town is connected by railway with Malmö, Göteborg (Göthenburg), and Stockholm. There is communication by steamer with Stockholm and ports on the east and west coasts of Sweden, Gotland, Stettin, Lübeck, Copenhagen, Hamburg, Bremen, Antwerp, and British ports; there are telegraph and telephone facilities at Norrköping.

Trade.—Exports consist of deals, feldspar, iron, paper, wood pulp and timber. Imports are coal, coffee, cotton, grain, piece goods, pig iron, machinery, sugar, etc.

Dock.—See Appendix I.

Repairs.—The Vulcan Company undertakes small repairs to vessels that can enter the dry dock. There are two mechanical workshops and a foundry.

Coal.—Coaling can be performed either from lighters or alongside a wharf, where there is a depth of 17 or 18 feet. There were about 10,000 tons of coal in stock in 1910.

Supplies.—There is a plentiful supply of provisions, also ship's stores. Good water is supplied by water boat, and can also be obtained from standpipes on the quays.

Tugs are available.

Norrköping — Harbor regulations.—Vessels arriving must show their colors and, if from foreign ports, keep them flying until after the customs examination. They must keep the channel clear for other vessels moving, and follow the customs regulations and directions received from the harbor master. If with explosives or inflammable oil on board, they must follow the special regulations applicable.

Vessels may not anchor in the dredged channel, but if compelled by necessity to do so must immediately warp clear. Dredgers must be passed on the side signaled, as follows: By day, two black balls at the masthead indicate that the dredger is at work, and a blue flag

at the respective yardarm indicates the side to pass; a red flag at the masthead indicates that no attempt should be made to pass. After sunset the balls will be replaced by a white light, the blue flag by two blue lights, and the red flag by two red lights, vertical.

Steamers within the harbor area between Ramshäll Point and Oskar Frederiks Bridge must slacken speed so as not to pass the distance between the notice boards on Ramshäll Point and the North Promenade in less than 15 minutes, and from that point to Oskar Frederiks Bridge speed must be still further reduced. When passing dredgers, loaded lighters, or other vessels speed must be so reduced that no damage is caused.

Vessels carrying passengers should follow the regulations concerning examination exactly, and the position of the gangway is to be properly lighted.

The steam whistle, siren, etc., is not to be used for signaling except in case of necessity, and funnels may not be swept between 5 a. m. and 10 p. m. when lying at the quay.

The engines may not be moved except for trial, and then only just before departure.

Should any person on board a vessel arriving at the harbor be thought to be suffering from cholera, smallpox, typhus, typhoid fever, scarlet fever, diphtheria, or dysentery, the sick must not be allowed to leave the vessel or cargo worked until the necessary medical examination has been made and permission given.

No person suffering from venereal disease or other contagious disease may leave the vessel until permission has been given.

For other detailed instructions as regards fire, working cargo, laying up for the winter, etc., the book of regulations, as printed, should be obtained and consulted.

Pilots for vessels leaving are obtained on application at the pilot office in the town.

The pilotage charge inward is 53 kroner for vessels of 400 to 500 net register tons up to 93 kroner for vessels of 900 to 1,000 tons; the outward charge is a few kroner more, and in winter the charges are about 25 per cent more than the above.

Lono Lighthouse and the west point of Näfveqvarne are the limits of Norrköping outward pilotage.

Pampus, the roadstead outside the entrance to the Motala, has depths of from 3½ to 8 fathoms, clay. Vessels can load here if necessary.

Directions for Bråviken.—The Southern Entrance to Bråviken lies between N. Fällbådan and Arköbådan, passing southward of Arkö, thence through Arkö and Gransö Sunds, from whence vessels can proceed to Norrköping or between the skerries across the entrance of Bråviken to Oxelö Sund.

Northern Entrance.—Having passed Hafringe Entrance, steer for Grässkären Lighthouse on a 286° bearing, passing about 150 yards northward of Kopparnageln, when steer 281° , which leads southward of Grässkären and about 200 yards northward of the northern head (1 fathom) of Glasgrunden, marked by a black spar buoy with ball; Klasgrunden extends $1\frac{1}{2}$ miles north and south and is awash in places. Here Vinterklasen, a high, easily distinguished islet, will be seen between Ljungskär and Betten Lighthouses; then steer 266° between Engelskagrund, with $1\frac{1}{2}$ fathoms, marked by a red and black spar buoy with two balls, to port, and a shoal of $2\frac{1}{2}$ fathoms, marked by a red and black spar buoy with cross, to starboard; this course leads over a patch of $4\frac{1}{2}$ fathoms, $\frac{3}{4}$ mile eastward of Engelskagrund. Continue the above course until within 400 or 600 yards from a shoal of 1 fathom lying near the shore and marked by a red broom buoy, when turn gradually to port and bring the two Kungshamn Lighthouses in line astern, bearing 70° .

To avoid the $4\frac{1}{2}$ -fathom patch just mentioned, a vessel of deep draft, when north of Klasgrunden, should steer 261° to pass southward of Engelskagrund, leaving to port a spar buoy with cross lying westward of Klasgrunden, the perch with triangular top mark on Håldämman Rock, and a black and white spar buoy on Kungshamnsgrund, awash; when Kungshamn southwest lighthouse is abeam, steer to pass northward of Mesen Rock, the reef of which is marked on its northeastern and southwestern sides by a black and white spar buoy, and bring the Kungshamn Lighthouses in line astern.

Continue past Mesen with the lighthouses in line astern, passing southward of Guldhällan, a shoal of 1 fathom marked by a broom buoy, lying off Gullängsberget, after which steer to pass between Hargö and Hargökalf, both of which are high and steep-to; pass 200 yards southward of Mjögö, the island west of Hargö, and thence steer 281° along the north shore of Bråviken toward Säterholm, about 9 miles distant. This course leads very near Grässkärsgrund, awash and marked by a black and white spar buoy, lying $1\frac{1}{4}$ miles westward of Mjögö.

From Säterholm, which is steep-to on the south side, steer to pass about $\frac{1}{4}$ mile southward of Kopparbo Lighthouse, before reaching which four black and white spar buoys, and, after passing it, a black spar buoy with two balls on the north edge of Algersgrund (3 feet), are left to port. From the last buoy steer 254° toward Stora Juten Lighthouse, passing 600 yards southeastward of Bodagrund, marked by a red and black spar buoy with cross; from 200 yards northward of Stora Juten a course 251° leads across Pampus to the outermost dolphin at the entrance of the channel to Norrköping, leaving on the way a red spar buoy with upturned broom over ball, on a shoal of $3\frac{1}{4}$

fathoms to starboard, and a black spar buoy with ball on a 3-fathom shoal to port.

A stranger should not attempt the dredged channel to Norrköping without a pilot.

At night, after passing Hafringe Entrance, steer westward in the western white sector of V. Korpen Light, with it right astern between the bearings of 104° and 111° , and when the eastern white sector of Gräskären Light is seen between 276° and 285° keep in both white sectors until Kopparnageln, a rock a little more than 1 mile westward of V. Korpen, is passed. Then alter course 10° to port into the green sector of V. Korpen Light, and pass through the red and into the southern white sector of Gräskären Light.

When passing Gräskären, keep V. Korpen green light in sight, which leads southward of the shoals, but if that light can not be distinguished the southern white sector of Gräskären Light leads southward of the westernmost shoals of Gräskären. When certain of being past Gräskären turn to starboard and enter the red sector of that light, the southern limit of which, bearing 100° , leads northward of Klasgrunden, as does also the eastern white sector of the northeast Kungshamn Light between the bearings of 263° and 271° . When within the last-named sector, steer toward Kungshamn Light until within 400 yards of it, then alter course to port and steer along the Kungshamn Islets at the distance of 200 yards; when west-southwestward of the islets bring the two Kungshamn Lights in line astern bearing 70° and steer 250° .

When southwestward of Gullänsberget a vessel may anchor, if unable to take the passage between the high islands, Hargö and Hargökalf, or continue on the 250° course until within the eastern white sector of the light at Näfveqvarne, then steer for it between the bearings 294° and 299° , passing it at a distance of about 400 yards; enter the southwestern white sector of the same light and keep it astern between 68° and 78° until the western white sector of Löno Light is entered; alter course to starboard and keep this light astern, bearing about 108° , until Säterholm is reached.

After Säterholm is passed, steer along the land, heading a little southward of Kopparbo white light, and when that lighthouse is left astern and the western white sector of light is entered, keep it astern between 72° and 78° until $1\frac{1}{2}$ miles past the light; then steer toward Stora Juten Light, in the white sector between 249° and 254° . Pass about 200 yards north of Stora Juten, and steer for the fixed red light on the dolphin at the outer end of the channel to Norrköping, for which a pilot should be employed by those not locally acquainted.

Anchorage.—As previously mentioned there is anchorage almost anywhere in the navigable portion of Brä Viken.

Oxelö Sund—Lights in Approach—Femörehufvud.—From the south side of a red house, with vertical white band on Femörehufvud, the southern extremity of Femörö Peninsula, an occulting white light is exhibited at the height of 38 feet above the sea, visible 6 miles in clear weather. (For arc of visibility see Light List.)

Fog signal.—In foggy weather a gong is sounded from Femörehufvud.

Betten.—An unwatched group occulting light, with white, red, and green sectors, is exhibited, 39 feet above the sea, from a white tower 20 feet high, situated on the western part of Betten Skerry. The white, red, and green lights are visible 7, 5, and 4 miles, respectively. (For details see Light List.)

Ljungskär.—An unwatched group occulting light, with white, red, and green sectors, is exhibited 23 feet above the sea, from a white tower 20 feet high, situated on the northwest side of Ljungskär. The white, red, and green lights are visible 6, 4, and 3 miles, respectively. (For details see Light List.)

Oxelö Sund.—From the pilot's house (of a red color) on the northern side of Oxelö Sund, eastward of Oxelö Sunds Hamn, a fixed white light is exhibited 65 feet above the sea, visible 8 miles in clear weather. It is not lighted from June 6 to July 6.

Korpholm—Light to be established.—A flashing light with white, red, and green sectors is to be established (1916) on Korpholm, at the new ironworks harbor, Oxelösund.

Oxelö Sunds Hamn, about $7\frac{1}{2}$ miles west-northwestward from Hafringe, has, in the outer part of the harbor, a depth of 6 fathoms, decreasing inwards, with a bottom of mud and clay; the western part of the harbor is shoal. Stone quays, on which railway lines are laid, have a total length of about 1,000 yards, with a depth alongside of from 26 to $7\frac{1}{2}$ feet at mean water level; besides, there are three piers, 64, 23, and 22 yards long, respectively, with depths alongside of from $24\frac{1}{4}$ to 13 feet at mean level. There are 22 cranes of 4 tons and one of 20 tons lifting power, as well as an elevator for discharging coal.

Several mooring and warping buoys are laid in the harbor. There are no harbor dues. A customs station is on Betten Island.

As a rule the port is not blocked with ice during the winter; navigation has not been closed during the last six years. There is an ice breaker at Oxelö Sunds Hamn.

Leading lights.—Two fixed red leading lights, elevated 21 and 33 feet above the sea, and 206 yards apart, are shown from the inner part of Oxelö Sunds Hamn. In line, bearing 319° , they lead into the harbor. Shown from July 6 to June 6.

A black light-buoy, showing a fixed red light, is moored in the inner part of the harbor, on the eastern side of the shoal ground.

Communication.—Oxelö Sunds Hamn is connected by railway with the interior and southern parts of Sweden. There is communication by steamer with Stockholm, Nyköping, Norrköping, and places on the Götha Canal. There are telegraph and telephone facilities.

Coal.—From 500 to 1,500 tons of coal are kept in stock (1913). Vessels can coal alongside a wharf 1,080 feet long, with from 10 to 25 feet of water alongside.

Supplies.—Provisions are not plentiful, but supplies can be obtained from Norrköping. Water is obtained from a water boat, or by hose from pipes on the quays.

Trade.—Exports consist of iron ore, iron, oats, paper, wood pulp, etc.; imports are coal and coke.

Tug.—A tug is available.

Pilotage.—There is a pilot station at Oxelö Sund, and pilots meet vessels at Vinterklasen.

Repairs.—There is a mechanical workshop, where small repairs can be effected.

Anchorage.—There is anchorage outside the harbor in the white sector of Oxelö Sund Light, between the bearings of 37° and 43° .

Quarantine anchorage.—An observation station for vessels coming from cholera-infected places is established at Oxelö Sund. The area within which vessels under observation must anchor is bounded as follows: On the south by a line from the southwestern point of Betten to the eastern point of Vinterklasen; on the west by a line from the last-named point to the east point of Löshufvud (the southern of the two large islets eastward of Femörö), and thence to the northwest point of Bjurhals; on the north by the western and southern coasts of Bjurhals, a line from the southeastern point of that island to the southwestern point of Furö, the southern and eastern coasts of Furö up to a point on the eastern coast where a line through the southwestern points of Stora and Lilla Espskär reaches the coast of Furö; and on the east by a line from the southwestern point of Stora Espskär to the northwestern point of Betten, thence by the western side of Betten as far as the southwestern point.

Small yellow painted cairns or cairnlike marks to indicate the above area are erected on the southwestern point of Betten, the eastern point of Vinterklasen, the eastern point of Löshufvud, the east coast of Furö, the southwestern point of Stora Espskär, and the northwestern point of Betten. On the northwestern point of Bjurhals the mark consists of a small white cairn.

Vessels must not anchor in the white light sectors of Ljungskär and Betten Lights.

Directions.—Having passed through Hafringe Entrance, steer 286° , toward Grässkären Lighthouse, passing less than 200 yards

north of Kopparnageln, then steer 281° to pass southward of the shoals of Grässkären; when abreast of the westernmost rock and about 800 yards distant from it turn gradually to starboard toward Vinterklasen, and when less than 1 mile from it turn again to starboard, passing westward of a shoal of $2\frac{1}{4}$ fathoms, southward of Betten, barked by a red spar buoy with broom, and steer toward the sund westward of Betten and eastward of the small Klashällen. From this sund the course is 321° toward Oxelö Sunds Hamn, passing west of Ljungskär, and a red spar buoy, with broom, marking a shoal west of Bjurhals, and eastward of three black and white spar buoys immediately outside the harbor; inside the harbor are two buoys similar to the last named, which are also left to port.

At night.—From Hafringe Entrance, steer westward in the western white sector of V. Korpen Light, and when the eastern white sector of Grässkären Light is seen, keep in both white sectors until past Kopparnageln, when turn 10° to port into the green sector of V. Korpen Light, passing through the red and into the southern white sector of light from Grässkären. The green sector from V. Korpen leads southward of Grässkären, but if it is lost sight of, the white sector of Grässkären Light leads southward also.

The green light from Betten will soon be seen, after which the white sector of that light will be entered, when turn to starboard and steer toward Ljungskär Light, keeping in its white sector, between 322° and 329° , which is seen about the same time as the Betten white light. Ljungskär white sector leads through the sound westward of Betten; pass 150 yards westward of Ljungskär Light and through its red and green sectors into the northern white sector between the bearings of 134° and 141° , which, kept astern, leads into the harbor, and with the aid of the two fixed red leading lights, between the mooring buoys.

Anchorage may be taken up outside the harbor, as previously mentioned.

Nyköping—Approach.—Nyköping, situated on the Nyköping River at the head of Nyköpings Fjärd, 7 miles northwest of Ledskär, is approached through Örsbaken, between Oxelö and Ledsjär, thence through a dredged channel over 4 miles in length from the northwestern end of Örsbaken, and through Nyköpings Fjärd, with a depth of 17 feet at mean water level. The channel is marked by red spar buoys with brooms and red dolphins on the east and north sides; on the western and southern sides by black and white spar buoys and black dolphins. A black conical buoy lies on the western side of the entrance and a red lightbuoy with fixed white light on the eastern side.

Lights.—The eastern and northern sides of the dredged channel have four lights on red dolphins, the outer three being fixed white and the inner one fixed green.

The southern and western sides have three lights—two fixed white 350 yards apart, the outer on a black dolphin and the inner on a wooden tower on the south shore about 1 mile from the harbor; the two in line, bearing 258°, leads through part of the channel westward of the inner white light on the northern side of the channel.

A fixed red light is shown from a black dolphin about 400 yards from the harbor.

Harbor.—The harbor has a depth of 17 feet at mean water level. On the eastern side of the river is a quay 405 yards long, furnished with railway lines, and on the west side is a small pier. Vessels of 16 feet draft can enter at mean level. In 1910 the port was closed by ice from January 7 to March 16, but navigation generally closes in the latter part of December and opens in the latter half of March. The difference between mean and low levels is 1 foot.

Light.—A green gas light is shown from the southern angle of the harbor quay.

Nyköping Town, situated about 800 yards from the mouth of Nyköpingsån, had 10,758 inhabitants in 1914; there are flour and cotton mills, wool-spinning factories, mechanical engineering works, foundry, etc., and it has a considerable trade.

Pilots.—Nyköping is a pilot station; vessels arriving from sea obtain their pilots at Hafringe, and those by the Skärgård Channel from Oxelö Sund or Säfö. Vessels leaving obtain pilots from the pilot station in the town.

Communication by steamer takes place with Norrköping, Oxelö Sund, Stockholm, and places between. There is railway, telegraphic, and telephonic communication.

Coal.—About 350 tons of coal are kept in stock; there is a coal wharf 250 feet long, with 16 feet of water alongside.

Supplies.—Provisions are plentiful; water can be obtained from the harbor master.

Trade.—Exports are iron, oats, and wood; imports, coal, cotton, grain, feeding stuffs, and manure. There is a British vice consul at Nyköping.

Repairs.—There is a mechanical engineering works, where small repairs can be carried out.

Nyköping—Harbor regulations.—Nyköping Harbor includes the lower part of the Nyköping River from Kors Bridge to the commencement of the town fjärd, and also the channel to Örsbaken, dredged and marked by dolphins.

The harbor regulations, a copy of which should be obtained on arrival, must be strictly adhered to, subject to fines and penalties.

Vessels arriving, subject to the direction of the harbor master or customs, must take up a position so as not to obstruct the channel. After the customs examination, report is to be made to the harbor master, and the vessel must proceed to the allotted berth and moor head to stream. Yards must be topped on the outer side and anchor removed from the cathead.

Anchors and warps may not be laid out or berth shifted without the harbor master's permission.

Warps and moorings may only be secured to the proper rings and bollards.

When vessels have completed working cargo they must move outside if required to do so by the harbor master.

For further details as to fire and lights, working cargo, etc., the detailed regulations should be consulted.

Nyköping Approach—Buoys.—A $5\frac{1}{2}$ -fathom shoal, which lies about $2\frac{1}{2}$ miles north-northwestward of Norrgrund, is marked on its eastern side by a black buoy with staff and ball. Västra Ringsögrund, with $4\frac{3}{4}$ fathoms over it, about 1,200 yards to the northward, is marked on its southwestern side by a red buoy with an upturned broom over a ball.

A red buoy with upturned broom over a ball is moored about $2\frac{3}{4}$ miles west-northwestward of Västra Ringsögrund and about $\frac{1}{2}$ mile west-southwestward of Norra Lillhammars Grund. A black buoy with staff and ball is moored 1.3 miles farther to the westward off Malskaren.

Between these buoys the channel is marked on each side, where necessary, by perches.

Lights—Ledskar Light.—On Ledskar, on the northern side of the approach to Nyköping about 8 miles east-northeastward of Enskar, a fixed light with white and red sectors is exhibited 22 feet above the sea from a white circular tower. The white light is visible 6 miles and the red light 4 miles. The light is shown from July 6 to June 6. (For details see Light List.)

Flashing lights with white, red, and green sectors were to be established (1916) on Lillhammars Grund, North Masklubben, and Trutbaden.

Enskär, 40 feet high, and thinly wooded, lies $10\frac{1}{2}$ miles eastward of Oxelö and $7\frac{3}{4}$ miles northeastward from Hafringe; it is the southernmost of a group of islands, extending about 6 miles in a southerly direction from the coast.

There are numerous dangerous shoals extending $4\frac{1}{2}$ miles in a southeasterly and $2\frac{1}{4}$ miles in a southerly direction from Enskär, and rocks and shoals awash extend about 600 yards south-southwestward from the south end of the island.

Light.—There is exhibited 43 feet above the sea on the southern end of Enskär, from a white octagonal iron hut, a flashing light with white, red, and green sectors. The white light is visible 12 miles, the red light 10 miles, and the green light 7 miles. This light, known as Hartzö Enskär, is exhibited from July 6 to June 6. (For details see Light List.)

Landmark.—Hargberget, on the northwestern side of Hartzö, is a wooded hill with a round summit and a bare patch on its south side.

Enskär Entrance—Shoals.—Kopman, a shoal of $3\frac{1}{4}$ fathoms, lies $2\frac{1}{4}$ miles south-southeastward from the southern end of Enskär.

Buoy.—Kopman is marked on its southern side by a red spar buoy, surmounted by an upturned broom over a ball.

Mälaren, with $4\frac{1}{4}$ fathoms on it, lies 2 miles southward of Enskär and $\frac{1}{2}$ mile westward of Kopman.

Valen, with $4\frac{3}{4}$ fathoms on it, lies 1 mile southward of Enskär. The above shoals are on the eastern side of the entrance.

On the western side, nearly $\frac{1}{2}$ mile northwestward of Mälaren, is a shoal of $3\frac{1}{4}$ fathoms, and northward of it, about 1 mile south-southwestward from the southern end of Enskär is Luren, a shoal of $3\frac{1}{2}$ fathoms.

Pilots for Enskär Entrance are obtained at Hafringe, and are necessary. There is a pilot station at Säfö Sund, where vessels are met.

Directions.—Approach Enskär Entrance with Hargberget, bearing 355° , to pass eastward of all the shoals off Hafringe, and when that islet bears 270° bring Harberget to bear 357° and steer for it, passing between Mälaren and the $3\frac{1}{4}$ fathom shoal northwestward of it and then between Valen and Luren Shoals. When $\frac{3}{4}$ mile from the south point of Enskär steer 333° in order to pass about 600 yards from the rocks and shoals extending from that point, and when the point is well abaft the beam steer northward, keeping about 400 yards from Enskär. Then pass midway between the southwestern point of Hartzö and Örskär, lying 700 yards westward of it. Northward of Örskär are some rocks and shoals marked by two black and white spar buoys, which are left to port. The course then trends more westward, between the skerries, and becomes difficult for those without local knowledge. Red broom buoys are left to starboard and black and white spar buoys to port. The least depth charted is $3\frac{1}{4}$ fathoms, westward of Ringsö and about $1\frac{3}{4}$ miles north of Örskär.

Anchorage may be obtained in a depth of from 9 to 15 fathoms in the entrance to a bay on the western side of Ringsö, northwestward of Hartzö.

Northward of Ringsö is Tvären Fjärd, where anchorage in a suitable depth, with clay bottom, may be found in several places. From

Tvären Fjärd a skärgård channel leads westward through Stendörren to Örsbaken, available for vessels of $11\frac{1}{4}$ feet draft at mean and $10\frac{1}{2}$ feet at low water level.

Säfö Sund, which leads eastward from Tvären Fjärd, is available for vessels drawing $14\frac{3}{4}$ feet at mean water level.

From Säfö Sund a channel leads eastward across the entrance of Yttre Hals Fjärd to Landsort, 13 miles east-northeastward of Enskär and Herrhamra Hamn. Another channel, available for vessels of $11\frac{1}{4}$ feet draft at mean water level, leads from Säfö Sund in a northeasterly direction across Yttre Hals Fjärd and through Bokö Sund to Trosa, a town situated 13 miles northwestward of Landsort and Södertelje. There is also a channel leading from Bokö Sund, southward of Mörkö.

Westward of Mörkö, Pålundet can be taken by vessels of $7\frac{3}{4}$ feet at mean and $6\frac{1}{2}$ feet at low level, but eastward of the island there is sufficient water for vessels of moderate draft.

Foreign men-of-war are not allowed to navigate to the northward of Landsort without special permission.

Landsort Lights.—On the southern extremity of Öja stands a white circular stone tower with red conical top, 85 feet high, from which, 146 feet above the sea, is exhibited an alternating fixed and flashing light, visible 18 miles.

From the same tower, at a height of 80 feet above the sea, a fixed light, with white, red, and green sectors, is exhibited, the white, red, and green lights being visible 15, 11, and 9 miles, respectively. (For details see Light List.)

Fog signal.—During thick and foggy weather an explosive report is given.

Ice signals.—A pole, fitted with a yard pointing southwestward and northeastward, has been erected to the northeastward of Landsort Lighthouse, from which the following ice signals will be given:

I. Two black balls hoisted on the southwestern yardarm indicates "Ice in the channel from Landsort to Stockholm."

II. One black ball hoisted on the northeastern yardarm indicates "The channel from Landsort to Stockholm is closed by ice."

Landsort has telegraphic and telephonic communication.

Pilots.—Landsort is a pilot station; pilots meet vessels 2 miles outside the southern point, in a decked boat. A black ball with a white central band, hoisted near the station, indicates that the pilot is there.

Approach to Södertelje (Södertälje)—**Outer shoals**—**Gäddan Shoal**, with $3\frac{1}{4}$ fathoms over it, lies $6\frac{1}{2}$ miles southeastward from Hargberget and 10 miles southwestward from Landsort. About

$\frac{3}{4}$ mile west-southwestward of it is a shoal of $4\frac{1}{2}$ fathoms, named Ranten, with a depth of 8 fathoms between them.

Buoy.—A black and white spar buoy, surmounted by two balls, is moored southeastward of Gädan Shoal.

A $5\frac{1}{4}$ -fathom shoal lies about $2\frac{1}{4}$ miles northeastward of Gädan Shoal. A black buoy with a white band, surmounted by a ball, is moored about 100 yards eastward of the shoal.

Clearing mark.—Hafringe (Häfringe) Beacon in line with Ö. Skålen, a rock $1\frac{3}{4}$ miles eastward of Hafringe, bearing 260° , leads southward of Gädan and all the shoals southeastward of Hartzö; and Landsort Light, bearing nothing northward of 48° , leads south-eastward.

Geten—Buoy.—Geten, a small rocky shoal, with $1\frac{1}{2}$ fathoms of water, situated $2\frac{1}{4}$ miles southwestward from Landsort Light, is marked on its eastern side by a black and white spar buoy, surmounted by a ball.

A 4-fathom shoal lies about $\frac{3}{4}$ mile northward of Geten. A black buoy, with white band, surmounted by two black balls, is moored about 100 yards southeastward of the shoal.

Clearing mark.—Viksten Beacon, open eastward of Landsort, leads eastward of Geten.

Göjknösen—Buoy.—Göjknösen, with $1\frac{3}{4}$ fathoms of water, lies 1.3 miles north-northeastward from Geten, and 1 mile west-southwestward from the lighthouse on Landsort; it is marked on its eastern side by a black spar buoy with ball top mark.

About 1 mile north-northwestward of Göjknösen and 1.3 miles west-northwestward from Landsort Lighthouse, a shoal, with a depth of $2\frac{3}{4}$ fathoms on it, is marked on the northeast side by a black spar buoy with a ball.

Bredgrund, with $3\frac{1}{2}$ fathoms water, lies 1,200 yards south-south-eastward of Landsort Lighthouse. The soundings to the southward of Landsort are very irregular; several shoals with from $4\frac{1}{2}$ to 9 fathoms over them extend $3\frac{3}{4}$ miles from the point, the depths between the shoals varying from 17 to 48 fathoms, the latter depth being within a mile of the point.

Clearing marks.—Mellsten seen close eastward of Viksten, bearing 30° , or Landsort Light between the bearings of 354° and 6° , leads between the shoals; Hargberget bearing 285° leads southward.

A 4-fathom shoal lies a little less than 1 mile east-southeastward of Landsort.

Inner lights—Grankubb.—A flashing light, with white, red, and green sectors is exhibited, 42 feet above the sea, from a white octagonal building on Grankubb, 5 miles northwestward from Landsort Light. The white light is visible 12 and 6 miles, the red 8 and 4

miles, and the green light 6 and 3 miles, respectively, for the intensified and unintensified light. (For details see Light List.)

Skoren.—A fixed white light, elevated 17 feet above the sea, and visible 9 miles, is exhibited from a white octagonal building on Skoren, a rock about $4\frac{1}{4}$ miles northwestward of Grankubb.

Oxnö.—A group occulting white light, is exhibited 80 feet above the sea, and visible 11 miles from a white octagonal building on Oxnö, about $1\frac{1}{4}$ miles northwestward of Skoren Light.

The above two lights in line, bearing 310° , lead from Grankubb into the white sector of Svarthall Light.

Svarthall (Svarta Hällen).—An occulting light with white, red, and green sectors is exhibited 10 feet above the water from a white octagonal hut on Svarthall (Svarta Hällen), a rock nearly 2 miles north-northeastward from Skoren Light. The white light is visible 6 miles, the red 4, and green 3 miles. (For details see Light List.)

Stenskar.—A flashing light, with white, red, and green sectors, is exhibited 33 feet above the sea from a white octagonal tower on Stenskar. (For details see Light List.)

Regarn.—An occulting light with white, red, and green sectors is located on Regarn about $3\frac{1}{2}$ miles northward of Stensgar Light. The light is shown from a white steel octagonal tower. (For details see Light List.)

Egelsholm.—A flashing light with white, red, and green sectors, is located on Egelsholm, about $2\frac{1}{2}$ miles northward of Regarn Light. The light is shown from a white steel octagonal tower. (For details see Light List.)

Egelsholm Light, in line with Regarn Light, bearing about 171° , leads between the broom buoys on Axviksholmarna and the black buoy off Salsudden.

Notholmen.—An occulting light with white, red, and green sectors is located on Notholmen. The light is shown from a white steel octagonal tower. (For details see Light List.)

Viad.—Range lights.—Fixed red range lights are located at Viad, about 3 miles northward of Notholmen. The lights in line bearing 60° lead through Brandalsund.

Igelsta.—A flashing light with white, red, and green sectors, is located at Igelsta about 4 miles northward of Viad. The light is shown from a white steel octagonal tower.

The above lights are unwatched, and are not lighted between June 6 and July 6.

There are several other lights exhibited in the inner waters, for which see chart and Light List.

Beacons.—Västra Röko, a low red rock 4 miles northwestward of Landsort Light, is marked by a white cairn beacon, 13 feet high,

with a red horizontal band, and above it a triangular board supported by poles.

Vattklubben, a rock about $2\frac{1}{2}$ miles north-northwestward of Västra Röko, has on it a white cairn beacon with oblique red band.

Kråkskär, about $1\frac{1}{4}$ miles north of Vattklubben, is marked by a white cairn beacon.

Hällsviken, at the inner end of the inlet of that name, about 10 miles north of Säfö Sund, is a steamboat station of the Stockholm-Hällsviken Line. The steamboat pier has a depth of $7\frac{3}{4}$ feet alongside at mean water level. The depths in the anchorage are from $1\frac{1}{2}$ to $4\frac{1}{4}$ fathoms. Pilots are obtained from Säfö Sund and Landsort.

Trosa, $13\frac{1}{2}$ miles from Säfö Sund, by the channel, is a steamboat station of the line just mentioned. There is a quay 93 yards in length. A narrow buoyed channel leads to the small harbor, in which and alongside the quay the depth is $7\frac{3}{4}$ feet at mean water level, bottom loose clay. Water and some provisions can be had. There are telegraph and telephone facilities. Pilots as at Hällsviken.

Oaxen lime works, on an island off the eastern side of Mörkö, about 14 miles south of Södertelje, has anchorage off it in from 8 to 14 fathoms, clay. There are four piers with $9\frac{3}{4}$ to 19 feet alongside at mean level; lime and limestone are shipped and coal landed. A tug is available. Vessels arriving obtain pilots at Landsort, and those leaving from Södertelje. There is communication by telephone.

The fairway leading to Södertelje lies on the western side of Landsort, where a pilot can be obtained. When approaching from the southward, and about 6 miles distant, steer for the lighthouse on Landsort, bearing between 354° and 6° , which will lead between the outlying shoals, and when within 1,200 yards of it steer 319° for the lighthouse on Grankubb, situated 5 miles northwest of Landsort Light, passing northeastward of Gjöknösen, Lillberget, and a shoal of $2\frac{3}{4}$ fathoms marked by a black spar buoy with ball, and southwestward of Tilljandersknallt with $2\frac{1}{4}$ fathoms, marked on its south side by a red spar buoy with upturned broom over ball. When Västra Röko Beacon bears four points before the beam alter course to 343° , passing westward of a shoal marked by a red spar buoy with down-turned broom over ball at $\frac{1}{4}$ mile south-southwestward from Västra Röko.

Thence the channel leads in a northerly direction, passing westward of Kolguskär and midway between Ljusskär and the Refskär Group; westward of Refskär is a fixed black perch with triangular topmark, which is left to starboard; the course then leads close westward of Vattklubben Beacon and thence northward for Kråkskär Beacon, 2 miles distant, passing eastward of Fifong, and leaving three shoals marked by two cross buoys and a broom buoy to starboard.

Kräkskär Beacon is left to port and course shaped to pass 400 yards eastward of the southeastern point of Grönsö, at the entrance to Himmersjön, 10 miles northward of Landsort, passing eastward of Österholmarne, Korsholm, and a black spar buoy with ball off the southeastern point of Grönsö and westward of Röda Klippan and another shoal marked by broom buoys. From the southeastern point of Grönsö the course leads midway between that island and Lisö Peninsula, leaving two broom buoys to starboard, and when abreast the south end of Pipskär, distant 300 yards, steer for the opening between Regarn and Koholm for about 1,600 yards, to pass eastward of an unmarked shoal of $2\frac{3}{4}$ fathoms, and then steer for Oaxen lime-works, passing westward of Regarn and midway between it and Oaxen, leaving a black and white spar buoy off the south end of the latter to port. The course then lies along the east coast of Mörkö, leaving several shoals to starboard, marked by red spar buoys with balls and brooms; a black spar buoy with ball, off Salsudden, is left to port.

Skanssundet is then passed through, the course leading east and north of a shoal of $2\frac{1}{2}$ fathoms, marked by a black and white spar buoy; a ferry crosses Skanssundet. Then the west coasts of Näslandet and Radö are kept on board, after which Brandal Sund, which has $19\frac{1}{2}$ feet of water at low level, is passed through, leaving three black and white spar buoys to port and a broom buoy to starboard. In Halls Fjärd the course lies along the western shore, passing westward of three islets; in the narrow sund at Hall a broom buoy is left to starboard and a black and white buoy to port, and two similar buoys are passed in Igelstadsviken.

All shoals near the above fairway, which should be avoided, are marked, with one exception; those on the west side by black and white spar buoys and black spar buoys with balls, those on the east side by red spar buoys with brooms or brooms and balls. There are also shoals marked by red and black spar buoys with cross.

Another fairway, lighted, lies (after passing Västra Röko) southward of Grankubb, with Skoren and Oxnö Lights in line, bearing 310° , until the white sector of Svarthall (Svarta Hällen) Light, showing between the bearings 355° and 0° , is entered, within the limits of which the light must be steered for until it is close-to. Hence a vessel can proceed westward through a buoyed and lighted channel to Bokö, or north-northeastward to enter the passage eastward of Mörkö Island.

Södertelje (Södertälje) **Uthamn**, in the innermost part of Igelstadsviken, has a quay 164 feet long, furnished with railway lines, and with a depth of $19\frac{1}{2}$ feet alongside at mean level; outside the quay the depths are from $3\frac{3}{4}$ to $5\frac{1}{2}$ fathoms, sand and clay.

Pilots.—The Södertelje pilots conduct vessels from the uthamn, and to all the towns and loading places in Lake Mälär. Coal is the chief import.

Provisions, water, and stores are obtained from the town, where also a tug is available.

Södertelje (Södertälje) Canal, at the head of Igelstadsviken, a continuation of Halls Fjärd, 27 miles northward of Landsort, is about $1\frac{1}{2}$ miles long, with a depth of $10\frac{3}{4}$ feet at low-water level, and connects Lake Mälär with the Baltic; at the north end, near the town of Södertelje, there is a lock 136 feet long, 28 feet wide, and $10\frac{3}{4}$ feet deep at low level. Vessels passing through this canal can proceed to Stockholm by Bockholms Sund, south of Lillö. The whole of the canal is being reconstructed and deepened to about 20 feet. Lina Sund to the northward is being dredged to about 12 feet.

Vessels of $27\frac{1}{2}$ feet draft can reach Skanssundet, $8\frac{3}{4}$ miles southward of Södertelje, at mean level, and those of $26\frac{1}{4}$ feet at low level.

Brandal Sund, about 6 miles south of Södertelje, is very narrow and can only be used by vessels drawing 18 feet and less.

Railway bridge.—A provisional double-track railway bridge over the southern part of the Södertelje Channel, from Rönnige to Ström, has a clear space of $32\frac{1}{2}$ feet and a clear height of $50\frac{1}{4}$ feet from the water level to the under part.

Lights.—Two white lights are shown at night on the piers of the bridge, one on each side of the channel.

Signals.—The following signals are made on the eastern side of bridge, where it joins the land:

Red disks in a direction across the channel by day, or a red light at night, signifies "Stop."

Red disks in the direction of the channel by day, or a green light at night, signifies "Clear."

CHAPTER VI.

THE STOCKHOLM SKÄRGÅRD FROM LANDSORT TO THE SEA OF ÅLAND.

Stockholm Skärgård.—Between Landsort and Björkö, 80 miles northeastward of it, lies an archipelago of islands or holms, with numerous rocks and shoals extending in some parts 30 miles from the coast; a large number of these islands are covered with brushwood.

The channels from the sea to Stockholm, except those by Arholma, are marked by red broom buoys on the starboard hand entering and by black and black and white spar buoys on the port hand. In the channels by Arholma the reverse of the above obtains.

No directions are given for the inner channels through this archipelago, the scale of the charts being too small to navigate them without local assistance.

Stockholm port of war.—Foreign men-of-war are not allowed to enter the war harbor district of Stockholm without special permission (see Chapter I). It consists of a zone within a line drawn from the mainland at S. Rorvik, westward of the Simpnäsklubb Light, going through the Simpnäsklubb Light, Söderarm Light, Grönskar Light, Hufvudskär Light, Röko Light, over the southern point of Yxelö to the mainland and the zone within a line drawn from the southern point of Järflotta, through Landsort to Ledskär.

Navigable depths.—The entrances to the most important channels leading to Stockholm are at Landsort, Sandhamn, and Söderarm. The channels are named, respectively, Dalarö Channel, Sandö Channel, and Söderarm or North Channel.

Sandö Channel is the shortest and most direct to Stockholm, the distance being about 32 miles.

The heaviest draft vessel that has visited Stockholm was of 24 feet draft; vessels of 24 feet can navigate the channels (except the Dalarö) from sea to Stockholm with the water at its ordinary level; and of 26 feet by the Sandö Channel to Träl Hafvet, below the fortresses of Vaxholm and Oskar Fredriksborg. Vessels are not allowed to exceed a speed of 7 knots when proceeding through the sund near Oskar Fredriksborg.

The channel abreast Oskar Fredriksborg, called Oxdjupet, has a depth of $26\frac{1}{2}$ feet at mean and $25\frac{1}{2}$ feet at low water level, over a width

of 82 feet; in the remainder of the channel the depth between the buoys is nowhere less than $21\frac{3}{4}$ feet at mean level.

Vessels drawing $11\frac{3}{4}$ feet at mean and 1 foot less at low level can pass through Kodjupet, between Träl Hafvet and Vaxholm.

In 1889 the British naval vessel *Ruby* (draft $19\frac{1}{2}$ feet) proceeded by Dalarö Channel and anchored off Stockholm in $19\frac{1}{2}$ fathoms, with the King's Palace bearing 318° and Katerina Church 251° . The least water in the Dalarö Channel has been found to be $3\frac{1}{2}$ fathoms.

The Söderarm Channel can be navigated by vessels of $25\frac{1}{2}$ feet draft.

The depths seaward of the Stockholm Skärgård are very irregular, and the outer shoals could not be approached by the lead, as the depths close to and within are greater than at a few miles seaward.

Pilots for the channels from sea to Stockholm can be obtained at the following places:

Landsort, latitude $58^\circ 45'$ north, longitude $17^\circ 53'$ east. The Landsort pilots take vessels to Dalarö, latitude $59^\circ 8'$ north, longitude $18^\circ 25'$ east, at which place the pilot is received who conducts vessels to Stockholm.

Hufvudskär, latitude $58^\circ 58'$ north, longitude $18^\circ 35'$ east. The Hufvudskär pilots take vessels to Dalarö, where, as before, the Stockholm pilot is received.

Sandhamn. The Sandhamn pilots take vessels to Stockholm. A pilot steamer is stationed near Sandhamn in winter to facilitate the pilot arrangements as far as the state of the ice and conditions of wind permit.

Söderarm, latitude $59^\circ 45'$ north, longitude $19^\circ 25'$ east.

Arholma, latitude $59^\circ 54'$ north, longitude $19^\circ 5'$ east.

The pilots of Söderarm and Arholma take vessels to Furusund, latitude $59^\circ 40'$ north, longitude $18^\circ 57'$ east, at which place pilots are obtained for Stockholm.

Landmarks.—The outer islands and skerries of Stockholm Skärgård possess but few objects by which they can be recognized from seaward. The southernmost of the large islands, Nätarö, Ålö, and Utö, are tolerably high and wooded. On a high hill at the northern part of Utö stands a large red windmill, which is easily recognized from seaward, and in certain directions can be seen from a distance of 25 miles.

In the northeastern part of the skärgård, the isolated skerries Svenska Stenarne, and Röder or Nor Skärgården, and Lyng or Söderskärgården, are tolerably high, the first named being of a light color, and are easily recognized from seaward.

Current.—The current near the skärgård and in the channels frequently runs in an opposite direction to the outer current in the Baltic. The current from the Gulf of Bothnia runs through the

Åland Sea in a south-southeast direction generally, thence in a south-westerly direction from Simpnäsklubb, through the skärgård to Landsort. In the vicinity of Svenska Högarne, vessels are often set in a westerly direction when approaching the skerries. At Svenska Björn Lightvessel the current has been observed to set westward toward the skerries at the rate of 3 miles an hour, especially before northerly gales.

Gun practice.—Periodical firing practice with shot is carried out on Träl Hafvet or W. Saxar Fjärd artillery ground, Stockholm Skärgård. The place from which firing is being carried out will be marked by day by two vertical red balls and by night by two vertical red lights. During the practice a red flag by day or two vertical green lights at night will be hoisted to the high signal staff on Tisterholm.

Mining practice.—Periodical mining practice is carried on in Östra fästningssundet, between Vaxholm Fortress and Rindö.

Dangers eastward of Landsort.—**Sebogrund**, situated 1.7 miles 118° from Landsort Light, is a shoal with 1 fathom of water over it. A little more than 1 mile southward of this shoal there is a depth of 52 fathoms, and $\frac{1}{2}$ mile westward of that depth there are only $6\frac{1}{2}$ fathoms.

About 1 mile 112° from the lighthouse and northwestward of Sebogrund lies a 4-fathom shoal.

Buoy.—The western edge of Sebogrund is marked by a red spar buoy surmounted by a ball under down-turned broom.

Clearing mark.—Måsknuf Lighthouse seen close eastward of Viksten, bearing 25° , leads westward of Sebogrund, about midway between it and the 4-fathom shoal northwestward.

Inre Karvasen and Yttre Karvasen.—Inre Karvasen is surrounded by a rocky shoal about $\frac{1}{2}$ mile in extent, $\frac{1}{2}$ mile eastward of Sebogrund, and about $2\frac{1}{4}$ miles east-southeastward from Landsort. Yttre Karvasen lies $1\frac{1}{4}$ miles southeastward of Inre Karvasen, and is also surrounded by a shoal. These rocks are small and low, and should not be approached nearer than 2 miles.

About $\frac{1}{2}$ mile eastward of Yttre Karvasen there is a dangerous shoal named Stenarne, with 1 fathom of water and a depth of 40 fathoms within 1 mile eastward.

Roxen is a cluster of low rocks lying $4\frac{1}{4}$ miles 95° , from Landsort Light, and 2 miles northeastward of Yttre Karvasen, with depths of 19 to 49 fathoms within $\frac{1}{4}$ mile around.

Gunnarstenarne is a group of skerries lying from 5.3 to 6.3 miles east-northeastward from the lighthouse on Landsort; these rocks are tolerably high and surrounded by deep water. On the northernmost and largest rock, named Norrskär, there is a conspicu-

ous heap of stones. About 400 yards south of Söderskär, the southeasternmost rock, lies a shoal awash.

Herrhamra Hamn.—This small harbor lies between the islands and shoals extending from the north extreme of Landsort and the islands on the southeastern side of Torö; the anchorage is in a depth of $5\frac{1}{2}$ to 11 fathoms, clay, 200 yards north of Krokskär. This harbor can be entered either from the western or the eastern side of Landsort; local knowledge is, however, necessary. Herrhamra Hamn remains free from ice longer than any harbor between Landsort and Björkö. There is a small pier with $7\frac{1}{2}$ feet alongside at mean level, at the head of Herrhamra Viken. Telephone at Herrhamra Farm.

Navigable depths.—The entrances to Herrhamra Hamn, on the western and eastern sides of Landsort, can be used by vessels of $17\frac{3}{4}$ feet draft at mean and 1 foot less at low water level.

It may also be entered from the Landsort-Dalarö Channel by vessels drawing $19\frac{1}{2}$ and $18\frac{1}{2}$ feet.

As local knowledge is necessary and the channels are buoyed, it is useless to give any directions. The anchorage is north of Krokskär.

Krokskär lies about midway between Landsort and Torö, and has on its highest part a white stone cairn beacon, with a red horizontal band, which indicates the entrance to Herrhamra Hamn. A pole with white triangular top mark is situated at the foot of the hill on which the beacon stands and in front of a red cottage.

Viksten—Beacon.—Viksten, 4 miles northeastward from Landsort Lighthouse, consists of two high round islets, northwest and southeast from each other, with deep water close around. On the summit of the southeastern islet stands an unpainted square cairn beacon, 7 feet in height; it has a yellowish appearance.

Shoals with depths of 22, 28, and 31 feet have been discovered between Viksten and Kastbadans Beacon. Vessels of deep draft should pass close eastward of the light buoy moored about 350 yards south-eastward of Viksten.

Skrapan.—About $\frac{3}{4}$ mile east of the southeastern Viksten lies a rock above water named Skrapan, 200 yards southward of which there is a shoal with $1\frac{1}{2}$ fathoms water. Between Viksten and Skrapan there is a depth of 26 fathoms.

Light.—From a white tower on the northwestern point of Viksten, 51 feet above the sea, a group flashing light, with white, red, and green sectors, is exhibited. The white light is visible 10 miles, the red 6, and the green light 5 miles in clear weather. (For details see Light List.)

Shown from July 6 to June 6; unwatched.

Light buoy.—A light buoy painted black, with a white band, exhibiting a flashing white light every 3 seconds is moored about 350 yards eastward of the southeastern Viksten.

Mellsten, situated in the entrance of Dalarö Channel, $4\frac{1}{2}$ miles northeastward from Viksten, has on it two hills, of which the southern is the higher. Within 1 mile of this island there are several shoals with deep water close-to.

Westergrund (Västergrund) — **Buoy**. — Westergrund (Västergrund), with $1\frac{3}{4}$ fathoms water, lies 1 mile south-southwestward from Mellsten, and is marked on its southwestern side by a red spar buoy with ball under down-turned broom. Östra Röko Beacon, seen open westward of Mellsten, bearing 30° , leads westward of this grund.

Dalarö Channel, the southern channel to Stockholm, is entered either by passing westward of Måsknuf Light or by the Danziger Gatt, and joins Sandö Channel in Kanholms Fjärd, $4\frac{1}{2}$ miles northeast of Landsort, to which place directions are given.

Lights—Måsknuf. — On a rock named Måsknuf, $\frac{1}{2}$ mile westward of Mellsten, stands a red house 21 feet high, from which, 29 feet above the sea, is exhibited a fixed white light, visible 10 miles in clear weather. (For sectors see Light List.)

Fogsignal. — During thick or foggy weather, a fog bell at Måsknuf Lighthouse is struck by machinery.

Norvik. — An occulting light, with white, red, and green sectors, elevated 46 feet above the sea, is exhibited from a white tower on Norvik Udde, $4\frac{1}{2}$ miles northwestward of Måsknuf. The white, red, and green lights are visible 7, 5, and 4 miles, respectively. (For details see Light List and Chart.) Shown from July 6 to June 6; unwatched.

Östra Röko. — A group flashing light, with white, red, and green sectors is exhibited at an elevation of 28 feet from a white octagonal hut on Östra Röko Rock, 3.7 miles northeastward from Måsknuf.

The white, red, and green lights are visible, 10, 7, and 6 miles, respectively. (For details see Light List.) Shown from July 6 to June 6.

Söderhäll. — A flashing light with white, red, and green sectors, is exhibited, 18 feet above the sea, from an octagonal white tower on Söderhäll Rock, situated about 8 miles northeastward from Östra Röko; the white, red, and green lights are visible 9, 7, and 6 miles, respectively. (For details see Light List.) The light is unwatched. Shown from July 6 to June 6.

Lilla Rotholm. — A flashing white light, elevated 20 feet above the sea, and visible 9 miles, is shown from a white octagonal hut on Lilla Rotholm, a small rock on the eastern side of Stora Rotholm, and about $4\frac{1}{2}$ miles northeastward of Söderhäll Light. Shown from July 6 to June 6. Unwatched.

Dalarö. — On the Saltsäcken shoal east of Dalarö an unwatched group occulting light, with white and red sectors, is exhibited at an elevation of 12 feet above the water from a white octagonal

lighthouse; it is visible 6 miles in clear weather. (For details see Light List.) Shown from July 6 to June 6.

Jutholm.—A group flashing light with white and green sectors is exhibited 10 feet above the sea, from a white octagonal hut on the southwestern point of Jutholm. The white light is visible 8 miles. (For details see Light List.)

Stendörren Light, about 4 miles northeastward of Dalarö, is a group flashing light with white, red, and green sectors; it is exhibited 18 feet above the sea, from a white tower southward of Stenkaringen Rock. The white, red, and green lights are visible 9, 7, and 6 miles, respectively. (For details see Light List.) Shown from July 6 to June 6. Unwatched.

A light buoy, red, conical, showing a fixed white light, is moored in the fairway about 400 yards eastward from Stendörren Lighthouse.

Fjärdhällorna.—An unwatched flashing light, with white, red, and green sectors is exhibited 16 feet above the sea from a white octagonal tower in the easternmost of the Fjärdhällorna Rocks, situated about $2\frac{1}{2}$ miles southeastward from Stendörren Light. The white, red, and green lights are visible 9, 6, and 5 miles, respectively. (For details see Light List.) Shown from July 6 to June 6.

A rocky ledge extends for more than 100 yards eastward from the lighthouse.

Shoal.—A shoal, with a least depth of $2\frac{1}{2}$ fathoms over it, marked on its eastern side by a plain spar, lies about $\frac{1}{2}$ mile northward of the lighthouse.

Grönö.—An unwatched occulting light, with white, red, and green sectors, is exhibited 26 feet above the sea from a white cylindrical tower on the southern point of Grönö, $2\frac{3}{4}$ miles northeastward from Stendörren Light. The white, red, and green lights are visible 6, 4, and 3 miles, respectively. (For details see Light List.) Shown from July 6 to June 6.

Shoal and buoy.—A shoal with $2\frac{3}{4}$ fathoms lies $1\frac{1}{4}$ miles westward from Grönö Lighthouse, and is marked on its western side by a red buoy with a ball and two down turned brooms.

Koftern.—A group flashing white light, visible 9 miles, is exhibited 20 feet above the sea from a white tower, 16 feet high, on the southeastern side of Kofoten, an islet situated nearly 2 miles east-northeastward of Grönö. Shown from July 6 to June 6; unwatched.

Franska Stenar.—A flashing white light is exhibited 17 feet above the sea, from an octagonal white reinforced concrete tower on Franska Stenar.

Långholm.—A white and red alternating light is exhibited 20 feet above the sea from a white tower, 16 feet high, on the south-

western point of Långholm, at the southern entrance to Kanholms Fjärd. The white light is visible 6 and the red light 4 miles. Shown from July 6 to June 6; unwatched.

Yxhammarkubb.—A flashing white light, visible 10 miles, is exhibited 25 feet above the sea from a white circular iron tower on Yxhammarkubb, $1\frac{1}{4}$ miles east-northeastward of Långholm. (For details *see* Light List.) Unwatched

Directions.—If bound to Stockholm through the Dalarö Channel from the southward, when about 6 miles distant from Landsort Light-house bring it to bear between 354° and 6° , and steer for it. When about 2 miles from the lighthouse bring Mellsten close eastward of Viksten, bearing 30° , this leads clear of all shoals up to Viksten, the lightbuoy southeastward of which is left to port; the course is then 22° , to pass westward of Måsknuf, which is steep-to on the western side, passing $\frac{1}{2}$ mile westward of Westergrund. From Måsknuf the course is 35° , to pass westward of Östra Röko Light-house.

The course between Måsknuf and Östra Röko Lighthouse passes northwestward of Nygrund, with $1\frac{1}{2}$ fathoms, marked by a broom buoy. Östra Röko should not be approached within 200 yards on the northwest side.

From Östra Röko a 41° course will lead southeastward of Ventlands Grund, with $2\frac{1}{2}$ fathoms water, marked by a black and red spar buoy with cross, to abreast Söderhäll.

The western extreme of Mellsten seen open eastward of Östra Röko leads eastward of Ventlands Grund.

Rånö, or Sand Grund, with $1\frac{3}{4}$ fathoms least water, situated 1.7 miles east-northeastward of Ventlands Grund, is marked on its western edge by a red spar buoy with broom. The western extreme of Långholm, the outermost islet near Nätarö, in line with the eastern extreme of Mellsten, leads nearly a $\frac{1}{2}$ mile northwestward of Rånö Grund.

About $2\frac{1}{4}$ miles east-northeastward of the southern end of Kapellön lies the Mysingsholms or Svan Grund with 2 feet water, marked on its northwestern edge by a red spar buoy surmounted by a ball under down-turned broom; this grund and Mysingsholm, $\frac{3}{4}$ mile northeastward of it, should be left to the eastward, and a low, white rock with a light on it, named Söderhäll, to the westward.

Mysingsholm is high and treeless; two pole beacons are shown on its western part.

The highest hill on Björkö open northwestward of Mysingsholm leads northwest of Mysingsholms Grund.

Anchorage may be obtained in a depth of 16 fathoms, clay, near Elfsnabben, with the south point of Kapellön, bearing 335° , distant about 800 yards.

Danziger Gatt, the eastern entrance to Dalarö Channel, lies between Mellsten and Nätarö, with depths of $5\frac{1}{4}$ to 19 fathoms in the middle. When approaching this entrance from seaward steer for the northeastern point of the islet lying close northward of Mellsten, bearing 308° , until within about 600 yards of it, and when Östra Röko Lighthouse is open westward of Klofskär, which lies nearly 1 mile northeastward of Mellsten, a patch of $5\frac{1}{4}$ fathoms will be abeam on the starboard hand, and the course should be altered to pass 400 yards eastward of the islet northward of Mellsten, and continue northward until Mäsknuf Lighthouse is in line with Viksten Lighthouse or the lighthouse on Östra Röko is in line with the southeastern side of the high Elfsnabben, when steer to pass westward of Östra Röko, and to the northeastward, as before directed, to Söderhäll. Östra Röko Lighthouse seen well open eastward of Klofskär leads eastward of the shoals lying south-southeastward from Mellsten.

At night Norvik occulting light, bearing 329° , and showing white, will lead through the middle of Danziger Gatt, until Mäsknuf and Viksten Lights are in line.

Söderhäll to Dalarö.—The general direction of the channel from abreast Söderhäll is northeasterly, and the distance 9 miles to Dalarö-skans (fort), which will be seen, when proceeding to the northward, in an opening between the skerries.

From Söderhäll the fairway leads westward of Björkö and Segelholm, 3 miles northeastward of Söderhäll, passing more than $\frac{1}{2}$ mile southeastward of Norrhäll, a small rock above water, to the eastward of which a black and white spar buoy is moored.

Between Segelholm and Stenskär, $\frac{3}{4}$ mile northwestward of it, lies a shoal with $2\frac{1}{2}$ fathoms water, marked with a red and black spar buoy with cross. This shoal should be left to port, thence the fairway leads eastward of Lilla Rotholm, between it and a red fixed perch with a topmark of two triangles, points downward. A stranger should not proceed beyond this without a pilot.

There is anchorage in a depth of 13 to 16 fathoms, sand and clay, abreast Dalarö.

At night—Landsort to Lolla Rotholm.—From the southward steer toward Landsort Light, between the bearings of 354° and 6° , to enter the white fixed sector of the low light between those bearings. When the white sector of Viksten (group flashing) Light is seen, steer toward that light, and when about halfway between Landsort and it steer to starboard and enter the green sector of Viksten Light in order to pass southward of the shoal of $4\frac{3}{4}$ fathoms south-southeastward of Gumman, and steer to pass the light buoy, exhibiting a flashing white, off the southeastern point of Viksten, on the port hand, after passing the light buoy, steer to enter the northern white sector. Keep within this sector and steer to pass close west-

ward of Måsknuf fixed white light. Having passed Måsknuf, steer toward Östra Röko Light, keeping in its white sector, pass about 200 yards westward of Östra Röko and steer 40° , keeping in the northern white sector of Östra Röko Light.

When the white sector of Söderhäll Light is seen, steer for that light and pass 200 yards southeastward of it, and when it again becomes white keep in that sector, with the light astern between the bearings of 214° and 224° , steering 39° to pass close eastward of Lilla Rotholm Light, when a pilot should be obtained.

After passing Lilla Rotholm, anchorage may be had under Gålö to the northward, in about 14 fathoms, clay, by rounding the east end of Stora Rotholm.

Dalarö to Kanholms Fjärd.—The main channel leading from Dalarö to Kanholms Fjärd, about 16 miles northeastward of it, leads through Jungfru Fjärden, between Stora and Lilla Husarö, two of the largest islands of a group 5 miles east-northeastward of Dalarö, thence through the Nämdö Fjärd, passing eastward of Kofoten, westward of Franska Struar Lighthouse and close to the west end of Långholm, to Kanholms Fjärd.

The Dalarö pilots conduct vessels to Stockholm, to sea by Landsort, Utö, through Jernholm Sund, Hufvudskär, Furusund, and other places.

Vessels of $13\frac{1}{2}$ feet draft at mean water level can proceed from Dalarö through Vindö Strom, about 15 miles northeastward of Dalarö, between Varmdö on the west and Djurö and Vindö on the east.

A shoal with a least depth of $3\frac{1}{2}$ fathoms lies on the southern side of the channel, southward of Vindö Island. It is marked on the northern edge by a black and white buoy.

Stendörren, a narrow pass $4\frac{1}{2}$ miles northeastward of Dalarö, can be used by vessels of 17 feet draft at mean water level.

The Husarö Channel between Kanholms Fjärd and Blidö Sund can be used by vessels drawing 16 feet at mean level, but is very narrow and tortuous in places.

From Nämdö Fjärd a deep channel leads in a northwesterly direction through Ingarö and North Engnö Fjärds, to Baggens Fjärd, which lies about 7 miles eastward of Stockholm. In Stäke Sund, leading from the western side of Baggens Fjärd, to Lännersta Sunden and Skuru Sund, thence to Stockholm, there is a depth sufficient for vessels drawing 8 feet at mean water level.

Nynäs Hamn, westward of Bedarö and northwestward of Måsknuf, has good anchorage in from $3\frac{1}{2}$ to 14 fathoms, clay. Quays about 435 yards in length and provided with railway lines have a depth alongside of $9\frac{1}{2}$ to 23 feet at mean water level. Ice obstruc-

tion may occur from February to April. There is a shipbuilding yard, with a small slip and mechanical workshops.

High water occurs generally with long-continued winds from west to northwest, and low water with winds from the opposite direction.

Two entrances lead to the harbor, the northern for vessels of the deepest draft and the southern for those drawing 13 feet, at mean level.

Shoals—Buoys.—A shoal of $2\frac{3}{4}$ fathoms lies near the middle of the northern part of the harbor, nearer Bedarö than the mainland.

A broom buoy is moored on the western side of the shoal.

A shoal with 16 feet over it, marked on its eastern side by a spar buoy, lies 500 yards northeastward of Nynäs Light.

A shoal of 8 feet, marked by a red broom buoy, lies on the Bedarö Side of the harbor, eastward of Nynäs Light.

A shoal, awash at its outer end, extends $\frac{1}{4}$ mile northeastward from Trehörningen, and is marked at its extremity by a black and white spar buoy.

Lights—Trehörningen.—Two range lights for Nynäs Hamn, 590 yards apart, in line bearing 359° , lead in from Viksten clear of all shoals, are shown from white wooden structures on, and southward of, Trehörningen.

The rear light, occulting white, is elevated 72 feet above the sea, and is visible 8 miles in clear weather. (For details see Light List.)

The front light, white and red alternating, stands on a rock at the height of 33 feet, and is visible, the white light 8 and the red light 5 miles. (See Light List.)

Bedarö.—An occulting light, showing white, red, and green sectors, is exhibited, 10 feet above the sea, from a white wooden structure on a rock off the western side of Bedarö. (For details see Light List.)

Nynäs.—An occulting light, with white, red, and green sectors, is exhibited, 99 feet above the sea, from a white house on trestles, on a hill near Nynäs Railway Station. The white light is visible 7 and the green lights 3 miles. (For details see Light List.)

The above lights are shown from July 6 to June 6 and are unwatched.

Pilots are obtained from Landsort, both for vessels arriving and leaving.

Anchorage.—The anchorage is northward or southward of the above-mentioned shoal of $2\frac{3}{4}$ fathoms; if anchoring southward of it, the shoal of 8 feet, marked by a red broom buoy, must be avoided. Two mooring buoys lie on the western side of Nynäs Hamn, abreast the northern end of Bedarö.

Directions by day—Northern Entrance.—The directions given for the Dalarö Channel should be followed as far as Måsknuf, having

passed which a course 351° leads about 400 yards eastward of Skorfva Rock and 1,200 yards westward of Örngrund, a shoal of $2\frac{1}{2}$ fathoms, marked by a spar buoy with cross. Just before reaching a red broom buoy on a shoal of 1 fathom, lying more than $\frac{1}{2}$ mile eastward of the harbor entrance, turn to port and steer westward to pass southward of Brunsviksholm and northward of some rocks off the north end of the northern of the Stegelholmar; the course is then southwestward into the harbor between Bedarö and the mainland.

Southern entrance.—Follow the directions for the Dalarö Channel, passing eastward of Viksten and steering to the northwestward until the two Trehörningen Lighthouses are seen in line bearing 359° , when steer for them; but should they not be seen, steer to pass a little eastward of N. Lökvikshäll Rock, when they will soon be sighted. With the lighthouses in line, three red broom buoys are left to starboard, the outer one on Erlandsgrund with $3\frac{3}{4}$ fathoms, the next on a shoal awash southward of the small skerry Simpgrund, and the inner on the shoal extending westward from Yttre Gården Island. On the port hand, after passing Simpgrund, two black and white spar buoys are passed, the outer of which marks a 3-fathom shoal, 65 yards northeastward of Pigbådan, with 2 feet on it.

When within 400 yards of the southern Trehörningen Lighthouse turn to starboard and steer in midchannel between Trehörningen and the south part of Bedarö, leaving a red broom buoy to starboard and a black and white spar buoy to port. Having passed the narrowest part of the channel, turn to port and steer northward between Bedarö White Lighthouse and a black and white spar buoy eastward of Trehörningen, and then into the harbor between the red and black and white spar buoys on the shoals previously mentioned.

At night.—Northern entrance.—Follow the directions for the Dalarö Channel, and when, after passing Mäsknuf and being in the white sector of Östra Röko Light, the white sector of Norvik Light is seen steer for it between the bearings 322° and 335° . Norvik Light is obscured over Örngrund. Having proceeded about 3 miles toward Norvik Light, the red sector of Nynäs Light will be entered bearing 301° , when turn to port and cross it into the white sector of that light, which should be entered before Norvik Light changes to red.

Steer toward Nynäs Light, keeping in the white sector between the bearings of 226° and 233° , which leads into the harbor and up to the quay; or a vessel may anchor within that sector or the green sector of the same light.

The red sector of Nynäs Light, above mentioned, covers the rocks north of Stegelholmar.

Southern entrance.—Follow the directions for the Dalarö Channel, and having passed northward to Viksten and through the red and green sectors of that light the Trehörningen leading lights should be seen. The rear light is occulting white, and the front light alternating white and red. Keep these lights in line until within the southwestern white sector of Bedarö occulting light, between the bearings of 31° and 35° , when steer for that light and leave it to starboard, passing through its red and green sectors into the northern white sector between the bearings 174° and 179° , and with this light astern steer into the harbor.

Communication.—There is railway, telegraphic, and telephonic communication; also by steamer with Stockholm, Trosa, Nyköping, Oxelö Sund, Norrköping, Visby, and Riga.

Supplies.—Some provisions, water, stores, and coal may be obtained at Nynäs.

Trade.—Exports are ironware and piece goods; imports are coal and grain.

Elfsnabben Hamn, inside Kapellön and Bjurhagslandet, is a good resort for vessels which are prevented from pursuing their voyage northward or southward by fog or other cause. The harbor is completely landlocked, and has depths varying from $4\frac{1}{2}$ to 24 fathoms, clay. There are two entrances, the southern being available for vessels of deep draft; the eastern entrance is very narrow, and although the depth is 23 feet, it should not be used by large vessels. The chart shows a depth of $2\frac{1}{4}$ fathoms eastward of the eastern entrance.

Pilots from Hufvudskär take vessels drawing up to 23 feet through Jernholm Sund, northeastward of Utö.

Dalarö, about 29 miles northeastward of Landsort, has depths of from 9 to 18 feet alongside the piers at mean level. Water and a few stores can be had. There is communication by telegraph and telephone; also by steamer with Stockholm.

Pilots.—Dalarö is a pilot station; pilots attend at the pier, and meet vessels off it.

Saltsjöbaden, on the west side of Baggens Fjärd, $9\frac{1}{2}$ miles north of Dalarö, has a roomy anchorage both eastward and southeastward of the place in from $6\frac{1}{2}$ to 19 fathoms; the bottom consists generally of sand and clay. A steamboat pier, 82 feet long, has from $9\frac{1}{2}$ to $14\frac{1}{2}$ feet alongside at mean water level; the railway quay, 180 feet long, has $19\frac{1}{2}$ feet alongside at mean level. There is communication by railway, telegraph, and telephone; also by steamer with Stockholm.

Gustafsberg, at the east end of Farstaviken, an inlet in the northeastern corner of Baggens Fjärd, about 12 miles northward of Dalarö, has completely sheltered anchorage in a depth of $6\frac{1}{2}$ to 8

fathoms, clay. It is stated that vessels of 16 feet draft can enter at mean water level, but the chart shows $2\frac{1}{2}$ fathoms in the entrance to Farstaviken. A quay 218 yards long, 164 yards of which are available for berthing, has depths alongside varying from $9\frac{3}{4}$ to $19\frac{1}{2}$ feet at mean level. Water can be had. There is communication by telegraph and telephone; also by steamer with Stockholm.

Trade.—Chinaware is exported from a large china manufactory in the place; coal and china clay are imported.

Hufvudskär, situated 26 miles east-northeastward from Landsort, is the easternmost group of islands extending from the northeastern end of Utö. Lökskär, the northernmost and highest of the group, with Manskär, the easternmost, and Alandskär (Ålandskär), form a small harbour with two narrow entrances, having in them dangerous rocks.

There are numerous shoals and rocks extending $1\frac{1}{2}$ miles eastward of this group, which should not be approached without local knowledge.

Pilots.—Hufvudskär is a pilot station; the pilots reside on Alandskär, and meet vessels outside the shoals in a decked boat, and conduct them to Stockholm, Saltsjöbaden, Gustafsberg, and Furusund, as well as through Husarö Channel and Träl Hafvet.

Light.—A fixed and flashing white light is exhibited 72 feet above the sea, from a tower on the roof of a red dwelling on Alandskär, the southernmost of the large islets of the Hufvudskär Group. The fixed light is visible 12 and the flash 14 miles.

(For details see Light List.)

Ice and lightvessel signals.—A framework, pointing southwest and northeast, has been erected on the hill to the northeastward of Hufvudskär Lighthouse, from which the following ice and lightvessel signals will be shown by means of black balls and cones, as follows:

One black ball on southwest arm: Grundkallen Lightvessel not on station.

Two black balls, placed vertically on southwest arm: Svenska Björn Lightvessel not on station.

One cone on southwest arm: Almagrundet Lightvessel not on station.

One ball on northeast arm: Northern part of Kalmar Sound closed by ice.

One inverted cone over one ball on northeast arm: Ice in channel from Hufvudskar to Stockholm.

One inverted cone on northeast arm: Channel from Hufvudskar to Stockholm closed by ice.

The signals concerning a lightvessel when she has been withdrawn from her station for the winter are suspended eight days after the

Departure of the vessel, and are resumed in the spring in good time before she is replaced.

Beacons.—On Östra Bommen Skerry, close eastward of Hufvudskär, stands a four-sided beacon, 20 feet high, painted white with a red horizontal band; the side toward the land is painted black.

On Lökskär is a steep round hill with a cairn on its summit.

Ålandskär (Ålandskär) has a cairn on its eastern point.

Tärngrund Beacon, 1,400 yards northward of Lökskär, is a pole with square top mark, the eastern half of which is white and the western half black.

A perch is erected on the northern side of Tärngrund.

Korskubbar Beacon, on the western of the Korskubbar Rocks about 800 yards northwestward of Tärngrund Beacon, is similar in appearance to the latter but higher, with the western half of the top mark white and the eastern half black.

Off-lying shoals.—Bådan, awash, and Herrgrund, with 3½ fathoms over it, lie ¼ mile and 1,400 yards, respectively, southeastward of Storskär, an off-lying rock 6 miles southwestward from Hufvudskär.

Ålandsbredan, a shoal with 9 fathoms over it and deep water around, lies 3.7 miles southward from Hufvudskär Light. A patch of 10 fathoms lies ¾ mile south-southwestward of Ålandsbredan. Utö Mill bearing nothing westward of 302° leads southwestward and Hufvudskär Light bearing 0° leads eastward of Ålandsbredan.

Vågen, with 10 fathoms over it and deep water around, lies 2.3 miles southeastward from Hufvudskär Light. Utö Mill bearing 283° leads southward, and Korskubbar and Tärngrund Beacons in line, bearing 316°, lead northeastward.

Borgsbredan—Buoy.—Borgsbredan, awash, lies 2.3 miles southwestward from Hufvudskär Light. A black and white spar buoy with ball top mark is moored close to the southeastern edge of this shoal.

Landbredan are two small shoals situated ½ mile northward of Borgsbredan; the eastern shoal is covered by 2½ fathoms of water and the western by 1½ fathoms.

Clearing mark.—Hufvudskär Light bearing 34° leads eastward of Landbredan and of Borgsbredan Shoal.

Hufvudskärs Hamn, completely sheltered by Lökskär, Manskär, Ålandskär, and some other islets, has depths of 4½ to 5½ fathoms; the bottom is generally stones and rock, with clay in some places. A shoal of 1½ fathoms lies southwestward of the anchorage. Vessels of 15½ feet draft can enter the harbor by the northern entrance, those of 18½ feet by the northwestern, and those of 11½ feet by the eastern entrance at low-water level; at mean level the draft may be 1 foot more. Water can be obtained.

At Nedergårdsö, 4 miles northwestward from Hufvudskär, feldspar is shipped.

Hufvudskär Entrance to Stockholm Skärgård.—The main entrance can be used by vessels of the deepest draft, and the southern, through Hufvudskärs Hamn, by those of $12\frac{3}{4}$ and $11\frac{3}{4}$ feet at mean and low levels, respectively.

Directions—Main entrance.—Approach Hufvudskär Lighthouse between the bearings of 280° and 290° , and when 2 miles distant from it bring Korsklubbar and Tärngrund Beacons in line, bearing 316° . This mark leads in between the outer shoals, passing southward of Brunan, with $5\frac{3}{4}$ fathoms, Blacken, with 2 fathoms, marked on its west side by a red spar buoy with downturned broom over ball, two small rocks surrounded by a shoal, and Lutgrund, with 2 fathoms, marked on its western side by a red spar buoy with broom; and northeastward of several shoals, the outermost of which is marked by a black spar buoy with ball, and the others by black and white spar buoys.

When Hufvudskär Lighthouse is seen in the middle of the sund between Lökskär and Manskär, a vessel can heave to and wait for a pilot if one is not already on board, or enter Hufvudskärs Hamn by steering toward the north point of Lökskär and then rounding the west side of that islet closely, leaving two black and white spar buoys to starboard, which mark a reef on which are some small rocks above water; a vessel may also pass outside these rocks and southward of a red broom buoy on their southwestern side into the harbor.

Vessels of the deepest draft can, with a pilot, proceed to Jungfru Fjärden by the route eastward of Kymendö Landet, about 9 miles northward of Hufvudskär; the sund between Kymendö Landet and Ornö is available only for vessels of $18\frac{3}{4}$ and $15\frac{3}{4}$ feet draft at mean and low water levels, respectively.

Skerries.—Between Hufvudskär and Sandhamn, 22 miles northeastward of it, there are no practicable channels, and the numerous skerries are difficult to recognize. Norsten, about 5 miles from Hufvudskär, is bare with a tolerably high, rocky hill; Biskopsö, 4 miles farther northeastward, is wooded and lower; Långvikskär, about 3 miles farther, is nearly bare, with houses on it, and Söderö, to the southward, has a tolerably high hill; Bullerö, 3 miles north-northeastward of Långvikskär, is high and bare, with a noticeable rocky hill near the north end.

Beacons.—A beacon, 19 feet high, with a pentagonal shape, point downward, and one, 8 feet high, with a pentagonal shape, point upward, have been erected on Alskären and Kalken, respectively. These two beacons in line mark the position of the Almagrundet Light-vessel.

Off-lying shoals—Demban, situated $7\frac{1}{4}$ miles 54° , from Hufvudskär Lighthouse and $3\frac{1}{4}$ miles eastward of Norsten, is one of the outermost shoals, and has a least depth of $1\frac{1}{4}$ fathoms. Within a distance of $1\frac{3}{4}$ miles in an east-northeast direction from Demban are shoals with $4\frac{1}{4}$, $4\frac{3}{4}$, and $5\frac{1}{4}$ fathoms on them.

Buoy.—Demban is marked on its eastern side by a black and white spar buoy, surmounted by two black balls.

Clearing marks.—Hufvudskär Light bearing 240° leads south-eastward of Demban and the other shoals outside it, and Korsö Tower bearing 10° leads eastward.

Brandstensgrund, awash, lies nearly $5\frac{1}{2}$ miles south-southwestward from Grönskär Light and 3 miles eastward of Bullerö. Around the grund, except to the eastward, are several more or less dangerous shoals, the northernmost, with $3\frac{1}{2}$ fathoms on it, lying a short mile northeastward, and the outer shoal to the southward, with $2\frac{3}{4}$ fathoms, nearly $1\frac{1}{2}$ miles from the buoy.

Buoy.—Brandstensgrund is marked on the eastern side by a black and white spar buoy with two balls.

Clearing mark.—Grönskär Lighthouse bearing 15° leads eastward of Brandstensgrund and the other shoals mentioned. Grönskär flashing light in sight leads eastward of Brandstensgrund.

Almas Grund, with $2\frac{3}{4}$ fathoms least water, lies $6\frac{1}{4}$ miles southward from Grönskär Lighthouse, and is one of the two shoalest heads of the dangers existing about midway between Almagrundet Light-vessel and Brandstensgrund. Within a distance of $1\frac{1}{2}$ miles in directions east-northeast, east, southeast, and southward, are several patches with depths of $2\frac{3}{4}$ to 6 fathoms.

Buoys.—A black and white spar buoy, with staff and ball, is moored eastward of Almas Grund, on the east side of the eastern patch of $2\frac{3}{4}$ fathoms, and a red spar buoy with downturned broom over ball lies westward of Almas Grund and of a $3\frac{1}{4}$ -fathom patch southward of it.

Clearing marks.—Grönskär Lighthouse bearing 14° leads westward, Utö Mill bearing 245° leads southeastward, and Svartbådan Beacon well open southwestward of Sandö leads northeastward of Almas Grund.

Shoal—Buoy.—A shoal, with $5\frac{3}{4}$ fathoms over it, lies 3 miles 115° from Almas Grund, and is marked on its southeastern side by a black and white spar buoy.

Almagrundet Lightvessel, about $3\frac{1}{2}$ miles 117° from Almas Grund, and a short $\frac{1}{2}$ mile southeastward of the last-mentioned shoal of $5\frac{3}{4}$ fathoms, shows a flashing white light from a red towerlike light-mast: the light is elevated 33 feet above the sea and is visible 11 miles.

The light vessel is painted red, with the name *Almagrundet* on the sides in white letters, and has a jigger mast, carrying a red ball at the mast head.

Fog signal.—A siren, operated by compressed air, is sounded. Should the siren be out of order or not ready when required a bell will be rung.

When not prevented by ice *Almagrundet* Light Vessel will maintain her station throughout the year.

A black cone, point upward, will be hoisted at *Falsterbo Ref* Light Vessel, near *Ölands* South Point Lighthouse, and at *Hufvudskär* pilot station, when *Almagrundet* Light Vessel is absent from her station.

Grönskär Light.—An occulting and group flashing white light, elevated 111 feet above the sea and visible 15 miles, is exhibited from an octagonal granite tower, 76 feet high, on *Grönskär*, a rocky islet on the northern side of *Sandhamn* Entrance to *Stockholm*. (For details see *Light List*.)

Shown when the sea is free from ice. There are four red or white dwellings near the lighthouse.

Sandö Channel, or eastern entrance to *Stockholm*, leads through the shortest and most direct channels to *Stockholm*; this route is also the cheapest.

Landmarks.—*Korsö* Tower, $2\frac{1}{2}$ miles westward of *Grönskär* Lighthouse, is 74 feet high, circular, and built of dark-gray stone. The top of the tower is 146 feet above the sea, and it is visible from a distance of 17 or 18 miles. *Korsö* is partly wooded.

On *Sandö*, near the lighthouse, is the customhouse, a large white building, and on the low point southeastward of the lighthouse is a clubhouse, with a tower, belonging to the *Royal Swedish Sailing Club*.

South Side—Svartbådan—Beacon.—*Svartbådan* is a small skerry, 16 feet high, situated 2.7 miles southwestward from *Grönskär*, and has on it a beacon 30 feet high surmounted by an upright white cask. Within $\frac{1}{2}$ mile eastward of *Svartbåden* there are several small shoals covered by from 1 to 15 feet.

Stålbådan—Whistle buoy.—*Stålbådan* is a small rocky shoal with 2 fathoms of water, situated $2\frac{1}{2}$ miles south-southwestward from *Grönskär* Lighthouse. A black whistle buoy with ball topmark is moored 300 yards eastward of this shoal; the whistle is not generally heard at a great distance. When necessary on account of ice the whistle buoy will be replaced by a black buoy surmounted by one black ball.

Revengegrund—Buoy.—*Revengegrund*, with a depth of $3\frac{1}{4}$ fathoms, lying $1\frac{1}{2}$ miles south-southwestward from *Grönskär*, on the southern side of the fairway of *Sandö* Channel, is marked on its eastern side by a black spar buoy, surmounted with two balls.

Light buoy.—A black light buoy, showing a flashing white light every 2 seconds, is moored on the eastern side of Revengegrund. When necessary, on account of ice, the light buoy will be withdrawn.

Nitton Fots Grund—Buoy.—Nitton Fots Grund, with 3 fathoms on it, lying 148° , nearly $1\frac{1}{4}$ miles from Korsö Tower, is marked on its north side by a black spar buoy with ball.

North Side—Södergrundan, with 4 feet water, situated $1\frac{3}{4}$ miles south-southeastward from Grönskärs Lighthouse, is about 200 yards long north and south, and 100 yards broad. About $\frac{1}{4}$ mile westward of Södergrundan is a patch of $3\frac{1}{2}$ fathoms.

A red bell buoy, surmounted by an upturned broom over a ball, is moored 100 yards southward of Södergrundan.

When necessary, on account of ice, the bell buoy will be replaced by a red buoy with an upturned broom over a ball.

Lights—Sandhamn Light, on the wooded north point of Sandö, at the entrance of this channel to Stockholm, is a fixed, group flashing, and flashing light with white and red sectors, exhibited 33 feet above the sea from a green tower on a green dwelling, 36 feet high, and visible 11 miles. (For details see Light List.)

A fixed red light, visible 6 miles, is shown from the same tower toward the skärgård.

Prickgrundet.—About $\frac{1}{2}$ mile southeastward of the light on Sandö, group flashing light, with red and green sectors, is exhibited from a lantern on the gable of a white house, 13 feet above the sea, visible, red light 6, green 5 miles. This light shows green to seaward, and red towards Sandhamn.

Ädkubb.—From a white cylindrical iron tower on Ädkubb, about 1 mile south-southwestward from Sandö, an occulting light, with white, red, and green sectors, is exhibited at the height of 21 feet above the sea. The white light is visible 9 miles, red 6, and green 5 miles. (For details see Light List.)

Skötkobb.—From a white cylindrical iron tower on Skötkobb, about 400 yards westward of Sandö, a flashing light with white, red, and green sectors, is exhibited 8 feet above the sea. The white, red, and green lights are visible in clear weather 8, 6, and 5 miles, respectively.

The above three lights are exhibited from July 6 to June 6; they are unwatched.

Lightbuoy.—A black lightbuoy, with fixed white light, is placed on the shore reef close northward of Sandhamn Light; it is left on the port hand when entering from seaward. The buoy is maintained from July 6 to June 6.

When necessary, on account of ice, the lightbuoy will be replaced by a plain mark.

Pilots.—Sandhamn is a pilot station; pilots attend there and on board a cruising cutter as long as it can keep the sea; when it can no longer do so the pilots attend on Korsö and go off from there. In the winter months when ice and wind conditions render it necessary a steam pilot vessel is employed to facilitate the service. The pilots conduct vessels to Stockholm, Furusund, and through the Husarö Channel.

Communication.—At Sandhamn there is communication by telegraph and telephone.

Anchorage.—Sandhamn Road, outside Prickgrundet, and open to winds between east and south, has depths between $5\frac{1}{2}$ and $12\frac{1}{2}$ fathoms, sand.

Korsö Sund, between Korsö and Kroksö, northwestward of it, has 8 to 11 fathoms, clay.

The inner harbor of Sandhamn, inside Prickgrundet, has depths of from $5\frac{1}{2}$ to 16 fathoms; vessels anchor in the channel, and secure with stern hawser to heavy anchors buried in the sand on the low point southeastward of the customhouse.

In the bight southeastward of the customhouse there are three piers; the pilots' pier on the north side of the bight has a depth of $11\frac{1}{2}$ feet alongside; the steamboat pier has 8½ feet; and the sailing club pier has 14 feet, at mean level.

Directions.—When approaching Sandö Channel, Sandhamn entrance to Stockholm Skärgård, steer toward Korsö Tower on a course between 308° and 325° , and when from 4 to 5 miles distant from it bring Sandhamn Customhouse open of the east point of Sandö, bearing 305° , or, as this mark is difficult to distinguish, especially in winter, bring the north gable of the clubhouse touching the south gable of the customhouse, which mark carefully preserved leads in between the bell buoy on Södergrundan and the whistle buoy on Stålbådan, passing nearer the former than the latter, and northward of Revengegrund and Nitton Fots Grund. The above mark leads close southward of a shoal of $3\frac{1}{2}$ fathoms, northward of Nitton Fots Grund, to avoid which a vessel may keep a little to port. The course then leads southward of a red spar buoy with up-turned broom over ball, southwestward of Korsö, and northward of two black spar buoys, each with one ball, southeastward and eastward of Sandö. Immediately after passing the last black buoy with ball, the red broom buoy on Prickgrundet is left to starboard, and steering northward a vessel may anchor in the inner harbor, or, leaving another black spar buoy with ball and the light buoy to port, proceed into the skärgård.

If wishing to anchor in Korsö Sund turn to starboard when 400 yards outside Prickgrundet and pass westward of a red broom buoy

on the reef extending westward from Korsö; a shoal of 1 fathom in the entrance to the sund, marked on the north by a black and white spar buoy and on the south by a red broom buoy, may be passed on either side, after which anchor in the middle of the sund.

As Sandhamnsundet is very narrow, large vessels ought to pass southward and westward of Sandö. When steering to port to avoid the $3\frac{1}{4}$ -fathom shoal northward of Nitton Fots Grund, turn gradually about $3\frac{1}{2}$ points, and by so doing avoid a depth of $5\frac{1}{4}$ fathoms about 600 yards northwestward of Nitton Fots Grund buoy.

A vessel may pass northward of the $3\frac{1}{4}$ -fathom shoal just mentioned by keeping the tall white house near Sandhamn Light in line with or slightly open northward of a small white patch on an islet southwestward of Korsö, and when steering toward Ådkubb, the southeastern extremity of Stångskär and the northwestern extremity of Grönskär, open of each other, astern, is a good mark; but a shoal of $4\frac{1}{4}$ fathoms lying $\frac{1}{4}$ mile eastward of the red spar buoy southward of Sandö should be avoided.

When past the buoy southward of Sandö turn northwestward, leaving Ådkubb to port, avoiding a shoal of $2\frac{1}{4}$ fathoms lying 600 yards northeastward of that islet, marked on its northern side by a black and white spar buoy and a broom buoy southwestward of Sandö to starboard, then steer northward, passing between Skötkobb Light-house and Sandö and nearer the former than the latter. Afterwards pass between the northwestern point of Sandö and a black and white spar buoy to the westward of it, marking a shoal of 1 fathom: the course then turns northwestward round a small islet, where it joins the pecked line shown on the chart, on which line about 1 mile west-northwestward of Sandö there is a patch of $4\frac{1}{4}$ fathoms.

Shoal.—A shoal with 16 feet lies about 400 yards northward of the north point of Sandö, marked on its southern side by a broom mark.

At night the lights on Almagrundet Light vessel and Grönskär, keeping eastward of the flashing sectors of the latter, assist in entering the sector of fixed white light from Sandhamn, between the bearings of 303° and 305° , which leads in between the shoals. In order to give Revengegrund a wider berth, when Grönskär Light shows groups of 4 flashes turn to starboard into the group flashing white sector of Sandhamn Light, returning to the fixed white sector when Grönskär Light becomes occulting.

In the vicinity of the shoal of $3\frac{1}{4}$ fathoms previously mentioned, which lies within the fixed white sector of Sandhamn Light, keep on the southern edge of that sector, at its junction with the flashing red sector of the same light. Prickgrundet Light is left at a suitable distance to starboard, after which anchorage may be taken up in the inner harbor; or proceed farther leaving the next point of Sandö at

the distance of 200 yards and pass northward of the lightbuoy into the skärgård.

To proceed southward of Sandö, being on the junction of the fixed white and flashing red sectors of Sandhamn Light, to avoid the $3\frac{3}{4}$ -fathom shoal mentioned above, as soon as the red sector of Adkubb Light is seen bearing 263° , steer about 280° , to the junction of the red with the white sector of that light and steer toward it to avoid the shoal of $4\frac{1}{4}$ fathoms lying within the white sector until the green sector of Skötkobb Light is entered, when steer about 304° , passing through Ådkubb's green sector into the narrow white sector of Skötkobb Light, which follow carefully. The shoal of $2\frac{3}{4}$ fathoms, lying 600 yards northeastward of Ådkubb, is within the white sector of light from Skötkobb and must be avoided. Pass 100 yards eastward of Skötkobb and with its northern white sector astern proceed into the skärgård channel inside Sandhamn.

Kanholms Fjärd to Träl Hafvet.—As local knowledge is necessary and the best tracks are shown on the charts no directions are given for this channel, but from Galtholmen the southern of the tracks shown on the chart would appear to be preferable for a large vessel.

Shoal and beacon.—A shoal with $3\frac{1}{4}$ fathoms over it, lies in the southern track about 200 yards southward of the south extreme of Angsö, marked on its northern side by a beacon.

The following directions describe the route taken by the British naval vessel *Indomitable* on September 27, 1912, on the occasion of the visit of the second cruiser squadron to Stockholm. Although pilots are compulsory, the directions may be of use to navigators when entering for the first time, although the bearings given may be only approximate.

From half a mile, 39° , from Almagrundet Lightvessel steer 334° direct for Grönskär Lighthouse for about $3\frac{1}{2}$ miles and then 324° for right extreme of Korsö.

Pass about 200 yards to the eastward of Revengegrund Lightbuoy and then steer 329° a little to westward of Stångskär until Korsö tower bears 294° , when alter gradually to 264° , with Grönskär Lighthouse touching the south extreme of Stångskär, right astern, and the south point of Sandö ahead.

Keep on this course until Korsö Tower bears 309° , when alter to 240° for the center of Trutgrund, which is a small flat rock practically awash.

When the northern point of Ådkubb comes in line with a high chimney on Runmarö, bearing about 266° , keep it so until past the red perch marking the shoal off the south point of Sandö. As soon as Skötkobb Lighthouse comes in sight, haul up to about 309° to pass about 200 yards eastward of the black perch marking the $2\frac{3}{4}$ -fathoms

shoal to northeastward of Ådkubb, and when the northern point of Sandö bears about 357° , haul gradually round to pass between Skötkobb and Sandö; after which gradually alter to about 294° to pass between Eknö and Skarp Runmarn.

The passage between Skötkobb and Sandö is the only really anxious part of the approach to Träl Hafvet, for the current (which runs with the wind generally) is strong and the passage extremely narrow. However, with a good quartermaster at the wheel and plenty of reserve speed to use if necessary, it is not half so difficult as it looks, as all dangers can be seen and the rocks can be approached within about 50 yards. It is of course advisable to reduce speed to about 8 knots at this place, and at such other places when the channel narrows considerably; otherwise a speed of 10 to 15 knots can be maintained throughout.

The track is for the remainder of the passage about in midchannel, except to the southeastward of Eknö, when it is necessary to keep well to the northward to avoid the shoal nearly in midchannel; and later on, when southeastward of Galtholm, it is necessary to hug the perches on the southern side of the channel for a similar reason.

Caution.—1. It is necessary to keep a very sharp lookout for the perches marking the channel, as they are not easily seen from the high bridge of a large ship; they frequently have to be passed quite close to, and of course to pass the wrong side would be fatal.

2. In the very narrow parts as, for instance, in the channel to the southward of Sippsö, keep a good lookout astern to see that the stern is not swinging on to the rocks through erratic steering—the rocks are very close.

3. Watch carefully the trend of the shore and follow it approximately, otherwise you may find yourself shaving corners closer than is desirable.

The anchorage at Träl Hafvet is good, but the water is very deep, and plenty of cable is necessary. The second cruiser squadron anchored in from 20 to 30 fathoms.

NOTE.—The “black” perches marking the port side of the channel are painted black about halfway up, and the tops white.

Passage out.—The track out is practically the opposite to the track in.

After passing Skötkobb, steer direct for Ådkubb Lighthouse and haul to 129° as soon as Grönskär Lighthouse is in sight. Look out sharp for the black perch on the 2½-fathoms shoal off Ådkubb.

Anchorage.—There is anchorage in the southern part of Träl Hafvet, between Ekholm and Hästholm, west-southwestward of it, in 9 to 10 fathoms, stiff clay. From this anchorage, which is about 12 miles westward of Kanholms Fjärd, Oxdjupet is 2½ miles south-eastward, and Kodjupet 1,400 yards westward.

Also eastward of Morholm in about 20 fathoms.

A rock, with a depth of $4\frac{1}{2}$ fathoms over it, lies about $\frac{1}{4}$ mile southeastward of Morholm.

There is anchorage off Ytterby on the southeast part of Resarö, on the north side of Kodjupet, in from $3\frac{1}{4}$ to $4\frac{1}{2}$ fathoms, clay. There is steamer communication with Stockholm. Water can be obtained; other supplies must be procured from Stockholm or Vaxholm.

Stockholm, the capital and principal commercial seaport of Sweden, with a population of about 382,085 in 1914, is built partly on the mainland and partly on a number of small islands at the eastern entrance to Lake Mälär. These islands are connected with each other and with the mainland by bridges.

Stockholm Harbor.—From the islands separating it from Lake Mälär, Stockholm Harbor extends eastward to Fjärderholmar, and through Lilla Värtan to Älkistan Channel. The general depths are from 5 to 22 fathoms, with a bottom of mud for the most part.

A shoal of $2\frac{1}{2}$ fathoms, marked by a red broom buoy, lies on the north side of the fairway about 1,200 yards westward of Blockhusudden, and another of $4\frac{1}{2}$ fathoms lies in the fairway southward of the former; a shoal of $3\frac{1}{4}$ fathoms extends about 200 yards from the south shore of the harbor about 1 mile westward of Blockhusudden.

The harbor can accommodate a large number of vessels, either at anchor or alongside the quays. It is approached through the skärgård by the entrances at Landsort, Hufvudskär, Sandhamn, Söderarm, and Arholma; that by Landsort, the Dalarö Channel, has $3\frac{1}{4}$ fathoms in its shoalest part, but the others are available for vessels of deep draft. There is another entrance from sea and through Lake Mälär, by the Södertelje Canal, which has a depth of 10 $\frac{1}{2}$ feet at low level.

The harbor itself has three entrances from the skärgård, through Oxdjupet at Oskar Fredriksborg, and Kodjupet, and through Stäike Sund and Skuru Sund. The greatest draft that can enter is 24 feet, and those above 11 $\frac{3}{4}$ feet at mean, and 10 $\frac{3}{4}$ feet at low water level, must enter by Oxdjupet.

Navigation continues throughout the year, as an ice breaker keeps a lane open through the ice of the skärgård in winter.

The usual anchorage off Stockholm is in from 16 to 18 fathoms.

Lock.—Mälär Lake is connected with the harbor by a lock, 148 feet long, $31\frac{1}{2}$ feet wide between the gates, with a depth of 13 feet on the seaward sill, and 14 feet on the Mälär Sill, at mean water level. The width of the bridge opening is $29\frac{1}{2}$ feet at about 16 feet above the water and 24 feet between the upper edges of the bridge. The lock can be lengthened to 189 and nearly 229 feet.

Quays.—There are extensive quays in Stockholm Harbor; some of the most important are:

Stadsgård, length 1,640 yards, depth alongside 19½ to 27½ feet.

Skeppsbron, length 896 yards, depth alongside 14½ to 19½ feet.

Södra Blasieholm, length 480 yards, depth alongside 9½ to 13 feet.

Norra Blasieholm, length 459 yards, depth alongside 13 to 19½ feet.

Nybrovik, northeast quay, length 306 yards, depth alongside 13 feet.

Strandvägen, length 722 yards, depth alongside 9½ to 14½ feet.

Värtahamn, length 2,660 yards, depth alongside 21 to 26 feet.

Gasworks Quay at Ropsten, length 492 yards, depth alongside 16 to 23½ feet.

Cranes.—There are 20 cranes, fixed, traveling, and floating, worked by steam, electricity, and hand, with a lifting power of from 1½ to 60 tons.

For vessels bound to the gasworks quay at Ropsten and to Stocksund, there is a buoyed channel through Askrike Fjärd, northward of Lidingö, and through the southern part of Stora Värten.

Pilots.—Stockholm is a pilot station, where out-going vessels obtain pilots for the skärgård and the towns and places on Lake Mälär. There are harbor pilots.

Ice.—Information respecting the ice conditions on the south and east coasts of Sweden can be obtained at the chief pilot's office, Stora Nygatan 46; and also respecting the east coast and Gotland, at the telegraph office, 2, Skeppsbron.

Supplies.—Provisions can be obtained at moderate prices, but marine stores for vessels are expensive. Good drinking water is supplied by a water boat alongside.

Coal.—About 44,000 tons of coal are kept in stock, and upwards of 200,000 tons imported annually. There are three coal wharves 400, 450, and 606 feet long, with 21, 22, and 18 feet of water alongside, respectively, but coal is usually shipped in lighters. From 1,200 to 1,400 tons can be loaded in 24 hours. There are 150 lighters of from 50 to 300 tons; about 90 are kept loaded.

Docks—Patent slips.—See Appendix I.

Tugs are available.

Repairs.—There are three mechanical works, Lindberg's, Finboda, and Bergsund's the latter being on the Mälär side above the lock; also docks, patent slips, and two shipbuilding and several repairing yards where repairs of all descriptions to hull and machinery can be effected. There are cranes which will lift 40 and 25 tons; an ironclad of 3,500 tons has been built here.

Cylinders up to 90 inches can be cast and bored; boilers up to 40 tons can be made or repaired; shafts 34 feet long and 12 inches in diameter can be forged and turned; masts can be made and boats built.

There is a Royal Dockyard at Stockholm.

Time signal.—A black ball, 5 feet in diameter, is dropped from the School of Navigation, Stockholm, at the height of 253 feet above the sea and 101 feet above the ground. The ball is hoisted close up at 5 minutes before signal, and dropped at noon, Greenwich mean time, corresponding to 1 h. 12 m. 18.9 s. Stockholm mean time, or 1 h. 0 m. 0 s. mid-European standard time. The School of Navigation is situated on the southern side of harbor, close westward of a red brick tower.

Communication.—The State railways include nearly all the main lines; the western between Stockholm and Göteborg (Göthenburg); the southern from Falköping to Malmö; the northern from Stockholm to Upsala, Östersund, and the frontier of Norway; the eastern from Stockholm to Norrköping, Linköping, and Näsö; and the northwestern from Laxå to the frontier of Norway.

Frequent communication takes place by steamer with most of the towns on the coast and with those on the four great lakes; also steamship lines run to Brazil and the Plate River, South Africa, Australia, and East Asia, and there is frequent communication with the United Kingdom and the northern and most of the western countries of Europe.

Steamers leave Stockholm daily for the Baltic and Gulf of Bothnia, touching at Gefle and Haparanda; three times a week for Petrograd via Åbö and Helsingfors; weekly to Stettin; and twice a week to Lübeck, during the navigable season.

There is telegraphic communication between Stockholm, Norway, England, and the Continent. There is communication by telephone.

An ice-breaking steamer carries mails between Stockholm and Hangö, in Finland, during the winter.

A branch line is to be constructed to Kapelskar, and a harbor constructed at that place. By this means communication will be kept up with Åbö throughout the year.

Harbor regulations.—Stockholm Harbor is bounded on the west by the western entrance to the Karlsberg Canal, and includes the shores of Brunsvik with its waters, the town and shores of Djurgården, and the harbor of Stallmastaregården.

Vessels of over 120 feet in length must not enter the harbor further than the middle of Beckholm unless a special anchoring or mooring berth has been allotted to them. Vessels which are to immediately pass the sluice are exempted from this rule.

Until a berth is allotted vessels must anchor so as to swing clear of the quays and vessels alongside.

Speeds in the harbor are limited as follows:

The sea side, inside a straight line from the dock pump house and Beckholm and Tegelvik, 6 knots. Between the line above named and a straight line from the customhouse on Blockhusudden to Gus-

tafshög, opposite, 9 knots. The Malar Lake side, in the waters between Karlsberg Canal and Kungs Bridge, also in Klaravik, 6 knots. Inside a straight line between the east point of Langholm and Garnissonssjukhuset (the garrison hospital), 6 knots. Between the line named and the west point of Langholm, 9 knots. In Riddaholm and Karlsberg Canals, also Langholm and Reymersholm Sounds, 4 knots. In Arstavik, east of Astra Holmar, 4 knots. Under the railway bridge at Stockholm, 3 knots.

Vessels on arrival, men-of-war excepted, after the customs examination, must report to the harbor master, in detail, as regards the vessel, crew, cargo, etc.; also, in writing, as to any venereal or other contagious disease on board. If this can not be done on the day of arrival it must be carried out before noon on the following day. A copy of the harbor regulations will be provided free of charge to all vessels over 20 tons and should be consulted for details.

After the report to the harbor office a berth will be allotted according to priority of the report. Vessels must be berthed as indicated and not moved without permission. When one vessel is berthed alongside another, gangways must be placed over the inner one for working cargo under the direction of the harbor master.

Vessels may not anchor in the marked channels or secure to bridges, piers, stone beacons, buoys, or other marks, or to mooring or warping buoys unless going through the sluice, and boats may not be moored to the quays, steps, or floating bridges.

Vessels of under 150 feet in length show a single stay light at night; those above 150 feet, in addition to the stay light, show a stern light not less than 15 feet lower than the stay light.

When going alongside, spars must be rigged in, yards topped, anchors taken inboard, and everything outboard secured.

Vessels arriving with explosives anchor eastward of a line between Beckholm and Tegelvik, or on the Malar side, west of a straight line between Kungsholm Church and the bridge below Torkel Knutssons Gate.

Nothing may be thrown or dropped into the harbor, and special precautions must be taken when working cargo, ballast, etc.

Steam whistles may not be used except to prevent accident, and funnels of vessels alongside the quays may not be swept between 5 a. m. and 10 p. m.

A watch must always be set on board steamers at the quay.

For further details see the printed regulations supplied on arrival.

Exports and imports.—The principal exports in 1910 were bar and pig iron, implements and machines, iron ore, zinc ore, carpentry, woodpulp, paper, hides, wood, and stone. The chief imports were belting, bricks, cement, coal and coke, copper, salt, grain, flour,

mineral oil, pig iron, beams and rails, machines, tools, brandy and other spirits, wine, and coffee.

Vaxholm, about 1 mile southward of Kodjupet, and 9 miles east-northeastward of Stockholm, is a place of call for the steamers running between Stockholm and the northern skärgård. The depth at the piers and quay is from $10\frac{1}{2}$ to $12\frac{1}{2}$ feet at mean, and 1 foot less at low level. Water and some provisions can be obtained.

The speed of vessels passing through Vaxholm Sund, the passage between Vaxholm and Rindö, must not exceed 5 knots an hour, under a fine of 25 kroner.

Communication takes place several times a day with Stockholm by steamer; there is telephone communication, also a telegraph station at the fort.

Elevated cable.—A telegraph cable crosses the channel between Vaxholm Fab and Rindö, at a height of 130 feet above the water.

Radio station.—There is a radio station, open to the public at all hours, with a wave length of 600 meters at Vaxholm; call letters SA. F.

Härsten.—The groups of skerries between Sandhamn and Svenska Högarne (20 miles east-northeast of it) lie further apart and have a less number of shoals near them than the skerries southward of Sandham. Härsten, situated about 4 miles east-northeastward from Grönskär, has on it a fishing village, and a small harbor on the south side.

Shoals.—Rocks and shoals extend $1\frac{1}{4}$ miles northward and $1\frac{1}{2}$ miles east-northeastward from Härsten, the outer danger in the latter direction having $1\frac{1}{2}$ fathoms on it. Stengrund, with 8 fathoms on it, lies about 2 miles eastward of Härsten and about 1,600 yards outside Österskär, a rock above water. Jästan, with $6\frac{1}{2}$ fathoms, lies $1\frac{1}{4}$ miles east-southeastward; Leran, with 10 fathoms, nearly 2 miles south-eastward; and Timmerman, with $6\frac{1}{2}$ fathoms, 2 miles southward, of Härsten. Svenska Högarne Light bearing 40° leads eastward of these shoals.

Svenska Högarne is the easternmost group of the Stockholm Skerries. On the southwestern side of Storön, the largest of the group, there is a small harbor of refuge. Assistance in piloting can be given by the lighthouse staff.

Lillö, the southernmost of the group, lies 2 miles south-southwestward of Storön, is tolerably high, and has several rocks and shoals extending from its northern and eastern sides, but the western side is steep-to.

Beacons.—On Korsklubben, the easternmost small skerry on the southern side of the entrance leading to the harbor, stands a white stone beacon 10 feet high, surmounted by a red cross, on ground 17 feet above the sea.

On the northern side of the entrance channel are two white cairn beacons; the outer, on Skimparskär, is 10 feet high, on ground 15 feet above the sea, and the inner, on Skimparskatan, the southeastern point of Storön, 13 feet high, on ground 27 feet above the sea.

A small cairn beacon stands on the southern side of Storön and a similar one, named Kapten, on a rock on the southern side of the harbor.

Light.—On Storön stands a red iron lighthouse, 60 feet high, from which, 101 feet above the sea, is exhibited an alternating revolving light, visible 16 miles. (For details see Light List.)

Fog signal.—During thick and foggy weather a gun is fired. (See Light List.)

Off-lying shoals.—Numerous shoals extend $2\frac{3}{4}$ miles southward and $3\frac{1}{2}$ miles eastward of Storön; Branten, with $6\frac{1}{4}$ fathoms, is the outermost to the southward and Yttre Åbäran, with $2\frac{3}{4}$ fathoms, the outermost to the eastward.

Gillöga Skärgård is a cluster of small islands, rocks, and shoals situated 2 miles west-southwestward of Svenska Högarne. Storskär, the southernmost and highest of this group, is surrounded by numerous rocks and shoals, extending about 3 miles in a southeasterly direction, the two outermost having depths of 5 and 6 feet, respectively.

Clearing mark.—The lighthouse on Svenska Högarne, seen open eastward of Lillö, leads eastward of these shoals.

Köpmansgrund—Buoy.—Köpmansgrund, covered by $1\frac{1}{4}$ fathoms of water, and with deep water close around, is a dangerous pinnacle rock, situated nearly $5\frac{1}{4}$ miles 68° from Svenska Högarne Lighthouse. A black and white spar buoy, surmounted by a ball, is moored on the eastern side of this rock.

A shoal of $5\frac{3}{4}$ fathoms lies nearly 1 mile north-northeastward of Köpmansgrund.

Clearing marks.—Svenska Björn Light bearing 17° , leads eastward; and Svenska Högarne Light, bearing 253° , leads southeastward of Köpmansgrund and the $5\frac{3}{4}$ -fathoms shoal just mentioned.

Skerries.—Between Svenska Högarne and Söderarm (at $18\frac{1}{2}$ miles northward of it) there are several small outlying skerries which are difficult to recognize from seaward. On Skarf, about 6 miles 12° from Storön Lighthouse, there are several fishing huts; and Svenska Stenarne, 3 miles north-northeastward from Skarf, is a cluster of high and light-colored rocky islets.

Svenska Björn.—Svenska Björn, Ytterberget, and several other small skerries, extending $2\frac{3}{4}$ miles in a northerly direction from Svenska Stenarne, are low and difficult to recognize from seaward; in this vicinity there are numerous dangerous shoals, some of which extend nearly 5 miles eastward of the outer skerries.

Björnsgrund—Buoys.—At $1\frac{1}{2}$ miles northeastward of Ytterberget lies Björnsgrund with one fathom of water; a black and white spar buoy with two balls is moored off the east side of this shoal.

Shoals with depths of $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms extend $1\frac{1}{2}$ miles southeastward, and others with from 4 to $4\frac{1}{2}$ fathoms, about 2 miles eastward from Björnsgrund: one of 4 fathoms $1\frac{1}{2}$ miles east of the grund, and 4 miles 328° from Svenska Björn light vessel, is marked on its eastern side by a black and white spar buoy with ball.

At 4 miles 299° from Björnsgrund and 2 miles southward of Storgrund, there is a shoal with a depth of $3\frac{1}{2}$ fathoms upon it.

Light vessel.—A light vessel painted red, having two masts, each surmounted by a red ball, and the name "Svenska Björn" in white letters on sides, is moored 10.6 miles eastward from the Svenska Stenarne Group, and, 15.5 miles northeastward from Svenska Högarne Light.

The vessel exhibits two fixed white lights horizontally, 39 feet above the sea, visible 11 miles. Withdrawn on December 31, or earlier if necessary.

A gun is fired if a vessel is seen standing into danger.

Fog signal.—During thick and foggy weather a steam siren is sounded. If the siren is disabled, a bell is sounded. (See Light List.)

Shoals—Buoys.—Two shoals of $5\frac{1}{2}$ and $3\frac{1}{2}$ fathoms lie about a mile apart $9\frac{1}{4}$ miles and $8\frac{1}{4}$ miles, respectively, eastward from Svenska Stenarne. The eastern side of the $3\frac{1}{2}$ -fathom shoal is marked by a black and white spar buoy with two balls, situated about 1 mile west-northwestward of Svenska Björn light vessel.

A shoal of $3\frac{1}{2}$ fathoms, which lies about $7\frac{1}{4}$ miles eastward from Svenska Stenarne and about 3 miles westward from the Svenska Björn light vessel, is marked on its southwestern side by a black buoy with a ball top mark.

An irregular patch with from 3 to 7 fathoms $1\frac{1}{4}$ miles long, northeast and southwest, and $\frac{3}{4}$ mile broad, lies about 2 miles westward of the $3\frac{1}{2}$ -fathom shoal, and between this patch and Svenska Stenarne lie numerous other shoals of from $2\frac{1}{2}$ to 8 fathoms, the $2\frac{1}{2}$ -fathom patch being about $3\frac{1}{4}$ miles eastward from Svenska Stenarne.

About $4\frac{1}{4}$ miles northwestward from the light vessel and about 4 miles northeastward of Björnsgrund, there is a patch of irregular soundings under 10 fathoms about 2 miles long, northeast and southwest, and 1 mile broad. The shoalest head, of $4\frac{1}{4}$ fathoms, known as Tröskeln, lies about $5\frac{1}{4}$ miles northwestward from the light vessel, with depths of $4\frac{3}{4}$ and $4\frac{1}{2}$ fathoms $\frac{1}{2}$ mile northwestward and $\frac{3}{4}$ mile eastward of it, respectively. The patch is marked on its eastern end by a black and white spar buoy with one ball moored just outside the 10-fathom line.

Light buoy.—A light buoy, painted black with a white band, and exhibiting a flashing white light every 30 seconds, thus, flash 3 seconds, eclipse 27 seconds, is moored close to the black and white spar buoy at the eastern end of Tröskeln Shoal and about $5\frac{1}{2}$ miles northwestward of Svenska Björn light vessel.

Bogskär Light.—A flashing white light elevated 98 feet above the sea is exhibited from a brown cylindrical iron tower 84 feet high on the western Bogskär about $14\frac{1}{4}$ miles 112° from Svenska Björn Lightvessel.

Storgrund, with $2\frac{1}{2}$ fathoms water, and 9 to 40 fathoms close around, lies 5.3 miles 122° from Söderarm Lighthouse, and is the easternmost danger extending from the Söderarm Skerries.

Buoy.—Storgrund is marked on its northeastern edge by a black and white spar buoy with ball.

Between Storgrund and Långskär, the southernmost of the Söderarm Skerries, there are several shoals, some of which are awash; of these, Storgrunds Bådan, a patch about 1 mile in extent, lying 2 miles westward of Storgrund, has numerous shoal heads, one on the western side being awash.

Söderarm.—The Söderarm Skerries consist of numerous large and small bare islets situated on the southern side of the channel leading through Furusund to Stockholm.

Dangers—Olof Larsonsgrund—Buoy.—Northward of Längden, the easternmost islet, there are several shoals with 5 to 12 feet water; the most dangerous is the Olof Larsonsgrund, awash; from this shoal Söderarm Lighthouse bears 278° , distant 1.3 miles.

About $\frac{1}{2}$ mile north-northeastward from Olof Larsonsgrund lies a shoal covered with $4\frac{1}{2}$ fathoms water, with deep water around, and with a patch of 10 fathoms $\frac{1}{4}$ mile northeastward of it.

A black and white spar buoy, with 2 balls placed vertically, is moored about $\frac{1}{4}$ mile northeastward of the $4\frac{1}{2}$ -fathom shoal, with Söderarm Lighthouse bearing 254° , distant about 1.9 miles.

Clearing marks.—Tjärfven about three times its length north of Arholma Beacon, leads northeastward of the shoal of $4\frac{1}{2}$ fathoms, and Arholma Beacon kept midway between Söderarm and Tjärfven Lighthouses, bearing 298° , leads northeastward of Olof Larsonsgrund, and between it and the shoal just mentioned.

Norrgröndan, with 5 feet water, is the northernmost of the shoals extending from Söderarm Skerries, and lies nearly 1 mile northwestward from Söderarm Lighthouse.

Buoy.—The northern edge of Norrgryndan is marked by a black spar buoy with ball.

Light.—On Tollskär, the northernmost of the large Söderarm Skerries, stands a circular stone lighthouse 69 feet high, painted white with a red horizontal band, from which, at an elevation of 99

feet above the sea, is exhibited a revolving white light visible 16 miles.

(For details see Light List.)

Ice and lightvessel signals.—A framework, pointing south-southeast and north-northwest, has been erected northwestward of the lighthouse, from which the following ice and lightvessel signals will be given by means of black balls and cones:

One ball on eastern yardarm: Grundkallen Lightvessel not on station.

One ball over a cone on eastern yardarm: Finngrundet Lightvessel not on station.

One cone on eastern yardarm: Vastra Banken Lightvessel not on station.

Two balls, placed vertically, on western yardarm: Svenska Björn Lightvessel not on station.

One inverted cone over a ball on western yardarm: Ice in the channel from Söderarm to Stockholm.

One inverted cone on western yardarm: Oregrunds Grepen closed by ice.

One ball at masthead: Drifting ice north-northeastward of Orskar.

The signals concerning a lightvessel when it has been withdrawn from the station for the winter are suspended eight days after the departure of the vessel and resumed in spring before it is replaced.

The signals concerning the ice conditions are suspended when navigation for the winter has ceased in the channels embraced in the signals.

Pilots.—Söderarm is a pilot station: pilots keep a lookout from Söderarm Lighthouse and meet vessels 1 mile outside it. There is a pilot's signal mast, on which a black ball with a white central belt hoisted indicates that a pilot can be obtained.

Anchorage may be obtained in Styrjanshamn and Karskär Hamn, about $1\frac{1}{2}$ miles southward of Söderarm Lighthouse and westward and southwest of Karskär. The depth in the first-named harbor is from $6\frac{1}{2}$ to 22 fathoms and in the second from $6\frac{1}{2}$ to 16 fathoms. The bottom consists of stone mixed with sand and clay. In Styrjanshamn there are mooring rings. These harbors are occasionally used by vessels bound northward and prevented from proceeding on account of ice. Channels to these anchorages from the northward pass on either side of Tollskär. Vessels approaching from the eastward should pass southward of Längden. Pilots are obtained from Söderarm.

Tjärfven Rocks, the northeasternmost of the Söderarm Skerries, are about $\frac{1}{2}$ mile in extent northwest and southeast and lie $2\frac{1}{2}$ miles north-northwestward from Söderarm Lighthouse. A detached shoal patch, with $2\frac{3}{4}$ fathoms, lies about 600 yards northwestward, and

patches of $3\frac{1}{2}$ fathoms lies about 600 yards southeastward and 800 yards west-southwestward from the lighthouse.

Light.—From a castellated stone building, with flat roof, and a tower on the eastern angle, on the largest Tjärfven Rock, a group flashing white light is exhibited 56 feet above the sea, visible 13 miles. (For details, see Light List.)

Fog signal.—During thick or foggy weather a foghorn, operated by machinery, is sounded.

Håkanskär, situated nearly $3\frac{1}{2}$ miles 280° from Tjärfven, has on it several fishing huts and a cairn on the highest part. Dangers extend eastward $1\frac{1}{2}$ miles from Håkanskär, the outermost, named Bresken, being awash.

Gislinge, an island 2 miles southwestward, and Idö, about $3\frac{1}{2}$ miles westward of Håkanskär, are wooded.

Söderarm Channel—Lights—Lerskären.—On the two Lerskären, situated about 5 miles 260° from Söderarm Lighthouse, leading lights for the fairway are exhibited, which decrease in power on either side of the leading line. The eastern or front light is flashing white, 16 feet above the sea, shown from a white circular tower, and visible 9 miles; the western or rear light is occulting, with white, red, and green sectors, elevated 41 feet above the sea, shown from a gray circular tower, and visible 12 miles. In line they bear 241° . Unwatched. (For details see Light List.)

Botveskär.—A group flashing light, with white, red, and green sectors, elevated 23 feet above the sea, is exhibited from a white octagonal iron box on Botveskär, $1\frac{1}{2}$ miles westward of the western Lerskären Light; the white light is visible 10 miles, red 8, and green 7 miles. Unwatched. (For details see Light List.)

Kapelskär.—On Kapelskär, at the junction of the Söderarm and Arholma Channels, $10\frac{1}{2}$ miles westward of Söderarm Light, from the corner of a white house, a white and red alternating and fixed red light is exhibited at an elevation of 36 feet above the sea. The white light is visible 6 miles, red 4 miles. This light is unwatched. Shown from July 6 to June 6. (For details see Light List.)

Furusund.—An occulting light, white, red, and green sectors, elevated 25 feet above the sea, is exhibited from the gable of the pilot house on Kopmanholm, which forms the northeast part of Yxlan Island. The white, red, and green lights are visible 7, 5, and 4 miles, respectively. Shown from July 6 to June 6. (For details see Light List.)

Directions.—Söderarm, or North Channel into Stockholm Skärgård is available for vessels of $25\frac{1}{2}$ feet draft. To enter steer for Söderarm Lighthouse between the bearings of 175° and 285° ; if from the southward or eastward, Arholma Beacon kept accurately midway between Söderarm and Tjärfven Lighthouses, bearing 298° .

leads between Olof Larsonsgrund and the 4½-fathom shoal north-northeastward of it, and when about 1 mile northward of Söderarm Light heave-to for a pilot.

From nearly midway between Söderarm and Tjärfven Lighthouses a course 250° leads straight in through the skärgård for a distance of about 10 miles to abreast Kapelskär, at the junction of the Söderarm and Arholma Channels, passing northward of Norrgryndan and close southward of an unmarked shoal of 3¾ fathoms lying 2¾ miles, 276°, from Söderarm Lighthouse and about 400 yards westward of a line between Remmargrund, with 4 feet northward of the fairway, marked by a red buoy with upturned broom over ball, and Båtskärsbådar, southward of the fairway, marked by a black spar buoy with two balls.

Thence on the northern side of the channel are three red broom buoys, the center one of which, on Nygrund, awash, lies nearest the track; farther on are three similar buoys, one on either side of Utterkobbar and the innermost eastward of Botveskär Lighthouse, which is passed at a distance of over 200 yards. A shoal of 4¾ fathoms lying in the fairway over a mile eastward of Kapelskär should be avoided, and a patch of 3 fathoms, marked by a black and red spar buoy with cross, lying about 700 yards southward of that islet, is left to starboard, together with some buoyed shoals to the westward of it.

On the southern side of the channel, 1½ miles westward of Båtskärsbådar, is an unmarked shoal of 4¾ fathoms lying close to the track, with another depth of 3 fathoms about 300 yards south-eastward of it, marked on its northern side by a plain spar, and farther on two black and white spar buoys are passed. The track passes about 400 yards northward of Lerskären and close to a shoal of 3½ fathoms, marked by a black and red spar buoy with cross, lying ¼ mile, 285°, from the western Lerskären Lighthouse; farther on are three shoals, the eastern of which, with 4 feet, is marked by a black spar buoy with ball, and the others with 2½ fathoms and awash, respectively, with black and white spar buoys. About 1,200 yards eastward and westward of Plomman, a rather high islet, are shoals of 3 feet, marked by black and white spar buoys, and similar buoys lie northeastward of Marö, which has houses on it.

When the small, low skerry lying northward of Marö is on the starboard beam, alter course to 236°, toward the open entrance to Furusund; Blidö Sund, the next opening to the east, should not be mistaken for it. On the northwestern side of the fairway, southward of Ålandet Island, is a 3½-fathoms shoal, and one of 2¾ fathoms marked by a black and red cross buoy.

On the southeastern side of the fairway two black and white spar buoys are passed, one on a shoal of 2 fathoms westward of the south-

ern end of Marö and the other on the shoal extending westward from the small rock Asgrund.

A shoal of $3\frac{3}{4}$ fathoms, northwestward of Gasö, lies close to the fairway, and westward of the south point of that island is a shoal of 4 feet, marked on its northern side by a black spar buoy with ball, southwestward of which is an unmarked shoal of $2\frac{3}{4}$ fathoms; between the latter and the northeastern point of Yxlan is a patch of $1\frac{3}{4}$ fathoms, marked by a black and white spar buoy.

Within the entrance to Furusund a red broom buoy, marking the edge of a reef extending about halfway across the channel from the western shore, is left to starboard.

At night.—With the assistance of Söderarm and Tjärfven Lights bring Lerskären occulting and flashing lights in line, bearing 241° , remembering that this line leads over the $3\frac{3}{4}$ -fathom shoal previously mentioned as lying $2\frac{3}{4}$ miles 276° from Söderarm Light, and which should be avoided by a vessel of deep draft or by smaller vessels with a high sea. When about 1 mile from the East Lerskären Light, steer 255° for Botveskär group flashing white light, and as soon as the West Lerskären occulting red light is seen steer 245° , which will lead about 300 yards south of Botveskär Light. When Botveskär white light changes to green steer 257° toward Kapelskär alternating white and red light, and when Botveskär again shows white bring it right astern, steering 246° and keeping well within the white sector between the bearing of 64° and 68° , especially when Kapelskär Light comes abaft the beam and shows fixed red.

As soon as the white sector of Furusund occulting light is seen, between the bearings of 233° and 236° , steer toward it, keeping within that sector until the north point of Yxlan is abeam, when, to avoid the small shoal extending from the point northeastward of the light, steer to starboard into the green sector and into Furusund.

Quarantine station.—Fejan Hamn, north-northwestward of Botveskär, has depths of from 9 to 11 fathoms, clay, mixed with stone in some places; it is well sheltered and can receive vessels of the deepest draft. There are two mooring buoys in the northern part of the harbor.

Fejan is a quarantine station for vessels from infected or suspected ports. There is a pier 72 feet long, at which the depth is 18 feet at mean water level. The nearest post office and telegraph station are at Rådmansö and Furusund, respectively.

Furusund has anchorage in the bight northeastward of the customhouse pier in $1\frac{3}{4}$ to 9 fathoms, and southeastward of the pier in 5 to 16 fathoms; also on the opposite side, off Kopmanholm (Köpmansholm), northeastern part of Yxlan Island, in the bight northeastward of the light, in 9 to 14 fathoms, and southwestward of the light, up to the small bay of Lilla Furusund, in 4 to 16 fathoms. Of these anchorages, which have in general clay and sand bottom, the

first and last are used most, but not generally by large vessels. Care must be taken to anchor so as not to block the sound when swinging or to obscure the light.

The customhouse pier is 45 feet long, with $8\frac{3}{4}$ to $10\frac{3}{4}$ feet alongside at mean and 1 foot less at low level; a rock with $1\frac{1}{4}$ fathoms on it lies close outside the pier. On the Kopmanholm side there is a pier 62 feet long, at which the depth is from 13 to $15\frac{3}{4}$ feet at mean level.

Pilots.—Furusund Pilot Station is situated on Kopmanholm (Köpmanholm); pilots meet vessels in the sund and in the northern entrance to Blidö Sund. Furusund pilots conduct vessels to Stockholm, Dalarö, Sandhamn, to sea by Hufvudskär, and through the channel by Husarö; also to Norrtelje and to sea by Söderarm or Arholma.

Communication.—Furusund has communication by post, telegraph, and telephone; there is also telephone at Kopmanholm. The steamers of the Stockholm-Norrtelje line call at both the above piers.

Hogmarsö.—On the southeastern side of Hogmarsö, about $2\frac{3}{4}$ miles west-southwestward from Furusund Village, there is a ship-building yard with mechanical works, sawmill, and patent slip (see Appendix I) belonging to the Furusund Slip & Shipbuilding Co. A quay 377 feet long has $9\frac{3}{4}$ to $14\frac{3}{4}$ feet alongside at mean level. There is telephone communication.

Norrtelje is situated at the western end of a narrow inlet, about 10 miles long, the outer part of which is formed by Rådmansö on the south and Vätö on the north, and in which a vessel can anchor almost anywhere. It is approached by passing eastward of Kapelskär and through Tjockö fjärd.

There is anchorage outside the mouth of the river in from 10 to $19\frac{1}{2}$ feet at mean level, with clay bottom, and in the harbor the depths are $4\frac{1}{2}$ to $13\frac{3}{4}$ feet, clay and sand.

The quay on the north side of the river has from 5 to $13\frac{3}{4}$ feet alongside at mean level; at low level the depths are $1\frac{1}{4}$ feet less.

Directions.—Vessels of 13 feet draft can enter the harbor at mean level, by a channel through the road.

The leading mark through is the bath-house chimney, on the southern shore outside the harbor, seen midway between two pole beacons 476 yards westward of it, bearing 258° . The northern beacon has a square topmark, diagonal upright; the southern has a circular topmark. When 300 yards from the bath house turn to starboard and steer in mid-channel into the harbor.

Pilots.—Vessels from sea obtain pilots from Söderarm or Arholma; those in the skärgård from Furusund. Vessels leaving requisition pilots from Arholma.

Communication.—Norrtelje is connected with the railway system and has communication by steamer with Stockholm. There are telegraph and telephone offices.

Arholma—Beacon.—Arholma, 92 feet high, situated at the northern entrance to Stockholm Skärgård, 10 miles northwest of Söderarm Lighthouse, is wooded, and has on its highest part a cylindrical stone tower 50 feet high, painted red with a white horizontal band in the middle and a red-pointed roof. This beacon is seen best from the northward, but from the northwest and eastward the upper part only is seen over the wood.

A small pier, at which the depth is 8 feet at mean level, is situated about 300 yards north of the beacon. There is a telephone at Arholma, but post and telegraph offices are at Sterbnsnäs on Björkö.

Högsjär Beacon.—A white stone beacon, with red horizontal band in the middle, 21 feet in height and standing on the ground 46 feet above the sea, marks Högsjär, an islet $1\frac{1}{4}$ miles north of Arholma beacon.

Pilots.—Arholma is a pilot station: pilots attend on Källskären, situated 1,200 yards northward of Högsjär beacon, and meets vessels from sea from 1 to 2 miles outside the outer skerries in a decked boat, and also in the channel off Arholma beacon.

Arholma Entrance to Stockholm Skärgård.—There are two well-marked channels at Högsjär and Simpnäsklubb, a short distance northward of Arholma, leading inside the skerries to Furusund. The southern channel, via Högsjär, will be recognized by the beacon on that islet and can be used by vessels of the deepest draft; the northern channel, westward of Simpnäsklubb, is available for vessels drawing $20\frac{1}{2}$ feet at mean water level.

Lights—East Side—Simpnäsklubb.—On Simpnäsklubb (also called Skomakaren) the northernmost islet in the entrance to the northern Arholma Channel, stands a small red house 36 feet high, from a white turret on which, at an elevation of 45 feet above the sea, is exhibited a fixed white light, visible 12 miles. (For details see Light List.)

Fog signal.—During thick and foggy weather a foghorn on Simpnäsklubb, worked by machinery, is sounded.

Högsjär.—A flashing light with white, red, and green sectors, is exhibited 42 feet above the sea from a white octagonal hut on the small islet northward of Högsjär Beacon. The northern and southern white lights are visible 12 and 10 miles, respectively, the red light 8 miles, and the northern and southern green lights 7 and 6 miles, respectively. (For details see Light List.)

Arholma Leading Lights.—Front light.—An occulting red light, elevated 31 feet above the sea and visible 5 miles, is exhibited from a white iron and concrete tower, situated 600 yards southwestward of Arholma Beacon.

Rear light.—A fixed white light, elevated 52 feet above the sea, and visible 6 miles is exhibited from a white iron and concrete tower, situated 600 yards 164° from the front light. These lights are unwatched and are shown from July 6 to June 6.

Tyfö.—An occulting light with white, red, and green sectors, elevated 33 feet above the sea, is exhibited from a white house on the western point of Tyfö, about $4\frac{1}{2}$ miles southward of Arholma Beacon. The white, red, and green lights are visible 6, 4, and 3 miles, respectively. The light is shown from July 6 to June 6 and is unwatched. (For details see Light List.)

West side.—**Näskubben** light is exhibited from a lantern on the roof of a red house on the eastern side of Björkö, nearly abreast Källskären. The light is flashing white, elevated 21 feet above the sea, and visible 8 miles. (For details see Light List.)

Svedudden.—A group occulting light, with white, red, and green sectors, elevated 10 feet above the sea, is exhibited from a white tower on the point next northward of Svedudden, and about 2 miles southward of Näskubben. The white, red, and green lights are visible 6, 4, and 3 miles, respectively. (For details see Light List.) The light is shown from July 6 to June 6 and is unwatched.

Shoal—Buoy.—A shoal, on which the depth is $2\frac{3}{4}$ fathoms, lies in mid-channel between Tyfö Lighthouse and Käringen Rock Beacon. It is marked by a black and red spar buoy with cross.

Directions—Högsjär Channel.—From sea, approach Högsjär beacon on a 218° course, which leads nearly 200 yards southeast of a shoal awash, lying 600 yards northward of the beacon, and marked on its south side by a black spar buoy with ball. When within 200 yards of the rock lying close northeastward of Högsjär, and from which some foul ground extends, keep northward of the beacon, leaving two black and white spar buoys to starboard and, when past them; round the shoal extending southwestward from Högsjär, marked by a red spar buoy with broom, and steer for Svedudden Lighthouse. This course leads westward of a shoal of 3 fathoms, marked by a black and red spar buoy, with cross, and eastward of a shoal of $1\frac{1}{2}$ fathoms marked by a black and white spar buoy, $\frac{1}{2}$ mile northward of the lighthouse.

Pass not more than 200 yards from the shore northward of Svedudden Lighthouse, leaving to port a shoal of $1\frac{1}{2}$ fathoms marked by two red broom buoy and a shoal of $2\frac{3}{4}$ fathoms, westward of Granö, marked on its western side by a broom perch; the shoal off the point southward of the light is marked by a black and white spar buoy, and in the light southward of it is Granskärs Roadstead, where a vessel can anchor in from 9 to 14 fathoms, clay. This roadstead and the space southward of it is much used by sailing vessels, delayed by contrary winds.

A pilot is necessary for strangers proceeding farther into the skärgård; pilots from Arholma are exchanged at Furusund.

There is a small pier in the northern part of the light, at which the depth is $9\frac{3}{4}$ feet at mean level. There is also a small pier on Granö opposite, the southwestern part of Arholma, with a depth of 11 feet at mean level.

Simpnäsclubb Channel — Dangers in approach. — Hamm-läggör, awash, Rönkskärläggén, with 1 fathom, Karviksläggén, with 5 feet, and Flisäläggör, awash, all lie off the eastern side of Vaddö within 1 mile of the shore and from $8\frac{1}{2}$ to $4\frac{1}{4}$ miles north-northwestward of Simpnäsclubb Lighthouse.

Clearing mark.—Arholma Beacon in line with the eastern extreme of Björkö by day, and Simpnäsclubb Light bearing 154° at night, lead eastward of the above dangers.

Utanågrund — Buoy.—Utanågrund, awash, $1\frac{1}{4}$ miles north-westward of Simpnäsclubb Light, is marked on its northeastern side by a black and white spar buoy with ball, nearly $\frac{1}{2}$ mile from the nearest shore.

Clearing mark.—Arholma Beacon open eastward of Näskubben Lighthouse leads eastward of Utanågrund.

Directions by day.—Steer for Simpnäsclubb Lighthouse on a course between 154° and 225° , and when within $1\frac{1}{2}$ miles of it bring Näskubben Lighthouse to bear 172° , or as much westward of Simpnäsclubb as the width of that islet, and steer for Näskubben; when nearing Simpnäsclubb bring Arholma Lights in line, bearing 164° , which leads in, passing eastward of a black spar buoy with ball on the edge of the shore reef northward of Näskubben, and westward of two red broom buoys marking reefs eastward of that lighthouse. The northern of these two broom buoys marks the foul ground extending south-westward from a rock above water, named Gäflehästen, and lies close to the track; the southern is on the south-western side of a shoal awash, and is passed a little farther off. A shoal of $2\frac{3}{4}$ fathoms lies close north-westward of Gäflehästen.

The channel from Simpnäsclubb to Näskubben is very narrow, the leading line passing about 50 yards westward of the shoal of $2\frac{3}{4}$ fathoms just mentioned, and about 60 yards eastward of the shore reef.

Pass a short distance from Näskubben and head a little westward of Arholma Beacon, leaving a black and red cross buoy on a 2-fathom shoal to port, and a shoal of 1 fathom marked by a black spar buoy with ball to starboard. When past the latter buoy, head a little eastward of Svedudden Lighthouse, passing eastward of the black and white spar buoy on the $1\frac{1}{2}$ -fathom shoal northward of the light, and then follow the direction previously given for Högskär Channel.

At night, from the northward, steer for Simpnäsclubb fixed white light on a 160° bearing, and when nearing it keep to the west-

ward to bring Arholma Leading Lights in line bearing 164° , steer in with this mark keeping it accurately on, as the channel is very narrow. Vessels should avoid passing each other here.

When Svedudden occulting white light is seen between the bearings of 187° and 197° , steer toward or close eastward of it. Pass the light and land northward of it from 100 to 150 yards off, and avoid the southern red sector of the light between the bearing of 350° and the land, which covers the shoal off the point southward of the light. Anchor as convenient in Granskärs Roadstead, which is covered by the white sector of Tyfö occulting light between the bearings of 156° and 162° .

When approaching Simpnäsklubb, should Arholma Leading Lights not be seen, steer in with Näskubben Light close westward of Simpnäsklubb Light and pass close westward of the latter, observing that Näskubben Light is obscured about 120 yards westward of Simpnäsklubb. When past the latter, bring it on the port quarter, nearly astern, and Näskubben Light on the starboard bow, nearly ahead, which mark, with great caution, will lead between the shoals; when nearing Näskubben Light, keep to port into the obscured sector of Simpnäsklubb Light, and steer 172° until Svedudden white light is seen, when proceed as before directed.

A third channel into the Skärgård, named Stridholmssundet, passes southward of Vedlösa, an island southeastward of Arholma; it is buoyed, and is available for vessels drawing 17 feet at mean and 16 feet at low water level. It is seldom used, and a pilot is necessary.

Österhamn, on the eastern side of Arholma, is narrow, with depths of $3\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, mud and clay, and is a good winter harbor for a few vessels. On the northwestern side of the harbor is a pier, with $10\frac{1}{2}$ feet alongside at mean level.

There are two entrances; the northern, for vessels of 22 feet draft at mean water level, leads in westward of the rather high Ofvanskär and Demban, a small rock northward of it; the southern entrance, for vessels of 17 feet draft, leads from Stridholmssundet along the western side of Vedlösa.

Directions for northern entrance.—Steer 221° toward Arholma Beacon, and when about 1 mile from the land and the beacon just dips under the tops of the trees on Arholma turn about two points to port to pass westward of Demban, which will then show in the entrance to the sund between Arholma and Ofvanskär.

When Demban closes in on Ofvanskär, steer southward between the former and Arholma, and keep along the latter at a distance of about 100 yards until Arholma Beacon opens southward of a point of the island, bearing about 299° , and right over Österhamn. Round the point, keeping 200 yards southward of it to avoid a reef extending in

that direction, and steer toward the beacon, anchoring in the middle of the harbor.

Väddö Canal, which unites Stockholm and Öregrund Skärgårds, has a length of 3.6 miles and a depth of 12 feet at mean and 10½ feet at low-water level, which depth is also found in the narrow sunds at Ortalalund and Trästa, about 1¼ and 4¼ miles north of the northern entrance to the canal. The greatest draft that can pass through the canal is 9½ feet at lowest water level and 11¼ feet at the usual level, or when the gauge at the swing bridge shows at least 3.6 meters or 11¾ feet.

The canal begins in the south at Granö Sund, which connects Bagghus Fjärden with Bagghusviken, and passes through two lakes, of which Storfjärden is the northern and larger. In these lakes and also in Bagghusviken there is a dredged and buoyed channel with red dolphins and broom buoys on the east side and black and white dolphins and spar buoys on the west. The clear width of the opening in the swing-bridge over the north part of the canal is about 31 feet. The speed of vessels from Granö Sund across Bagghusviken to the southern canal must not exceed 5 knots, and beyond that 4 knots an hour. The canal is available for traffic by day and night, except when closed by ice or for repair.

Lights.—In the canal and the narrow sunds before mentioned 11 lanterns, each showing white, red, and green lights, are attached to dolphins; the white light in each case shows across the channel to light up the dolphin or buoy on the opposite side; those on the west side of the canal show red southward and green northward, and those on the east side green southward and red northward. A white light is shown from the swing-bridge when it is open for passage through and a red light when it is closed.

The six lanterns southward of the bridge are all on the west side of the canal; the southernmost is in Granö Sund and the northern at the north end of Storfjärden. A white light is shown at Bagghus Ferry when the fairway is open and a red light when it is closed.

Northward of the canal five lights are shown—one outside the entrance on the eastern side; two at the sund at Ortalalund, the southern on the west and the northern on the east side; and two, similarly placed, at the sund at Trästa.

The lights are shown from July 6 to June 6; they are unwatched, with the exception of those at the ferry and swing-bridge.

The coast between Arholma and Grisslehamn, 16½ miles northward of it, is wooded. On the southern part of Väddö there is an isolated hill, Väddö Kasberg, 164 feet high, with a bare summit, which is visible some distance from seaward. Abreast Väddö there are several shoals awash and with 5 and 6 feet water, extending about 1 mile from the shore; between these shoals and Grisslehamn the shore is tolerably steep-to.

CHAPTER VII.

THE COAST OF GERMANY; CAPE ARKONA TO MEMEL.

Cape Arkona (Gell ort), the northern extremity of Rügen Island is a bold headland composed of precipitous chalk cliffs about 148 feet high. Vessels rounding the cape should not approach it within the distance of 1 mile.

Telegraph beacons.—About 1,600 yards westward of the lighthouse on the cape there are two beacons indicating the direction of the submarine cable to Stafstens Udde; vessels are forbidden to anchor in the vicinity of the cable.

Light.—On Cape Arkona an electric group flashing white light, is exhibited 246 feet above the sea, from a yellowish round tower, 115 feet high, on a red octagonal substructure, with brown dome and two galleries.

About 33 feet southeastward from the lighthouse stands a red square tower with brown dome, 69 feet high, the old lighthouse.

The keeper's dwelling house is northeastward of the two towers.

Fog signal.—Near the chalk cliffs northward of Arkona Lighthouse, during thick and foggy weather, a siren is sounded. (For details see Light List.)

Signal and telegraph station.—There is a telegraph and day signal station on Cape Arkona, with which vessels can communicate by the International Code. The regulations and charges are the same as those given for Rixhöft. The mast, with yard, stands near the fog-signal house.

Ice signals.—Ice signals are shown at Cape Arkona.

Storm signals are shown here.

Life-saving.—A lifeboat and rocket apparatus are stationed at Cape Arkona.

Arkona Riff—Buoy.—Arkona Riff, extends over $\frac{1}{2}$ mile in an easterly direction from the cape, and has on it depths of 2 to 3 fathoms. A white beacon buoy surmounted by a topmark of two triangles, bases toward each other, and marked "Arkona O," is moored near the eastern extremity of this reef, with the two under-

mentioned beacons in line. About 600 yards northward of the buoy the depth is 4 fathoms, and the 5-fathom line lies about 1,600 yards from the shore, and at $\frac{3}{4}$ mile southward of the buoy and 1 mile from the shore is a patch of $4\frac{1}{4}$ fathoms. In winter a white spar buoy with the same topmark is substituted for the beacon buoy.

Beacons.—On the high shore southeast of the lighthouse there are two beacons, which in line show the direction of Arkona Riff. The western and higher beacon is surmounted by a square and the eastern by a basket.

Water level.—From the heights recorded by a self-registering water gauge on the beach below the lighthouse, the highest water was 2 feet $7\frac{1}{2}$ inches above and the lowest 3 feet 11 inches below, mean level.

Landing can be effected on the south side of the chalk cliffs of Cape Arkona, near Vitte Chapel, but it is not advisable to attempt landing on any other part.

Kriegers Flak (Möen Bank) lies $22\frac{1}{2}$ miles 330° from Cape Arkona. Its western end is $11\frac{1}{2}$ miles eastward of Möen Cliff, and it extends eastward for a distance of 10 miles, with a greatest breadth of 5 miles. It has depths of 8 and 9 fathoms over a sandy bottom, but on portions of it are large stones or rocks.

Telegraph buoy.—A black and red checkered telegraph buoy, surmounted by a staff, is moored in a depth of 25 fathoms about $3\frac{1}{2}$ miles east-southeastward of the eastern extremity of Kriegers Flak and 22 miles, 342° , from Cape Arkona, and marks the telegraph cable from that cape to Stafstens Udde, in Sweden.

Adler Grund, situated about 30 miles 78° from Cape Arkona, on the southwestern part of Rönne Bank, is about 6 miles long north-west and southeast and about 5 miles broad, within the depth of 6 fathoms, and has several shoals of stones with $3\frac{1}{4}$ fathoms least water.

These shoals may be avoided to the westward by the lead.

There are shoal patches with depths over them of from 4 to $5\frac{1}{2}$ fathoms at a distance of between 3 and 4 miles to the southward, southeastward, and eastward from the shoalest part of the Adler Grund. Vessels of large draft when passing to the southward and eastward of the shoal should keep outside the 10-fathom contour line.

Light buoy.—A light buoy, surmounted by two triangles, points downward, exhibiting a group occulting green light, group of two eclipses every 8 seconds, is moored 330 yards 205° from the wreck of steamship *Norden*, sunk on the eastern shoal spot of the Adler Grund and 3 miles southward of the lightvessel.

The light can not always be depended upon.

Light Vessels.—Adler Grund Light Vessel is moored in a depth of 10 fathoms, about 3 miles northward of the shoalest water on the bank; it is painted red, with the name *Adler Grund* in white letters on sides, has main and jigger masts, and carries a black frame ball at the mainmasthead. The light vessel is liable to be removed when in danger from ice.

The light is a group flashing white light elevated 37 feet above the sea (31 feet in bad weather), and is visible 11 miles. A white riding light is also shown from the fore part of the vessel.

(For details see Light List.)

Fog signals.—During thick or foggy weather, a siren is sounded. If the siren is disabled, a gun will be fired and a bell will be sounded.

A submarine fog bell is also sounded at the light vessel. (See Light List.)

Vessels seen standing into danger are warned by the firing of two guns, by the bell being rung, and by signals. Signals of distress from other vessels are, when necessary, repeated by the light vessel.

Ships can communicate by International Code signals with the light vessel, which is connected by telegraph with Rügen Island.

Three white spar buoys, each surmounted by two triangles, apex upward, and marked "Adlergrund N.," with the numbers 1 to 3 from west to east, are moored in line southward of the light vessel in an easterly and westerly direction and about $\frac{1}{4}$ mile apart, to indicate the vessel's station.

When out of position, a large dark-colored flag is hoisted at the main by day, the ball is struck, and only the anchor light is shown at night; in fog the bell only is sounded.

Radio station.—Adler Grund Light Vessel is fitted with a radio apparatus. A Morse signaling lamp has also been installed. The station only communicates with ships at sea in cases of necessity and regarding urgent matters concerning navigation. Under this are included in particular the transmission of information for the prevention of accidents to shipping or for the assistance of navigation—for example, inquiries and information regarding the lighting and buoyage of channels, alteration of currents, hindrances to shipping, storm warnings, etc. Call letters K. A. G.

Caution.—Vessels are warned not to pass southward of the light vessel, over the Adler Grund, especially as the light on the wreck light buoy is not to be depended on.

Tromper Wiek, situated on the south side of Cape Arkona, is formed by the peninsulas of Wittow and Jasmund. These peninsulas are joined by a low, narrow sandy isthmus named the Schaabe, which separates the inland waters of Rügen, named Breeger and Jas-

mund Bodden, from Tromper Wiek, which is about 4 miles deep, and 7 miles wide at its entrance, where there are depths of 10 to 11 fathoms, sand and gravel, decreasing gradually to 5 fathoms at from $\frac{1}{2}$ mile to $1\frac{1}{2}$ miles from the head of the bay.

In the northern part of Tromper Wiek, near the highland of Wit-tow Peninsula, the bottom consists chiefly of sand and gravel with rock occasionally; the southern part is more rocky, and near Königs Hörn, where the Schaabe joins Jasmund Peninsula, there are several rocky shoals with 6 to 9 feet water within 1 mile of the shore. Within the 5-fathom line the bottom is uneven and rocky, and does not afford very good anchorage.

Landmarks are, Breege Mill, Bobbin Church, and a single column-shaped tree near Glowe; also the Arndt Monument on the Rugard, near Bergen, is visible from the bay.

Anchorage.—With off-shore winds temporary anchorage may be obtained in the northern part of Tromper Wiek, about $\frac{3}{4}$ mile from the shore, in a depth of $6\frac{1}{2}$ fathoms, sand, with Goor Village bearing 7° and the mill at Nobbin 296° .

Spoil grounds have been established in the waters around Rügen. They are marked by brown barrel buoys, which are withdrawn in the autumn simultaneously with the summer seamarks.

Storm signals are shown near Königs Hörn.

Life-saving.—At Glowe, a small fishing village a short distance south of Königs Hörn, there is a rocket apparatus.

The coast of Jasmund Peninsula trends from Königs Hörn in an easterly direction $6\frac{1}{2}$ miles, thence southerly $3\frac{1}{2}$ miles to Sassnitz Harbor. The eastern part of the peninsula, Die Stubnitz, is elevated 440 feet above the sea, and covered with dense plantations; the chalk cliffs along this part are very conspicuous, the highest, Stubbenkammer, is 416 feet high, the projecting point of which is named Königs-tuhl. In the neighborhood of the storm signal station on Stubbenkammer, where chalk is shipped, there are two jetties for small vessels and boats to lie alongside; care, however, is necessary when landing to avoid the numerous bowlders which lie in the shallow water near the beach. The shore reef is steep-to and the bottom inside the 5-fathom line is rocky.

Lohme is a large fishing village situated on the high shore about 5 miles eastward of Königs Hörn, and may be recognized from a considerable distance seaward by its white houses. During the summer this village is much frequented as a watering place.

There is a small harbor for fishing boats, about 131 yards long and 55 yards wide in the center. It is entered from the northwestward between the head of a short mole on the westward side and the head

of a mole 120 yards long, which extends westward from the shore, and surrounds the harbor on the north and east. The depth at the mole is from $6\frac{1}{2}$ to $8\frac{1}{2}$ feet; farther in it decreases to $3\frac{1}{2}$ feet.

Fishing light.—A fixed red light is shown at the mole head for fishing boats entering at night; it is shown from dark until the return of the boats.

Life-saving.—There is a rocket station at Lohme.

Light—Ranzow.—A group flashing white light, elevated 180 feet above the sea, and visible 19 miles, is exhibited from a white, round, iron tower, with gallery and pointed roof, 21 feet high, situated on the high coast at Ranzow, about $\frac{3}{4}$ mile eastward of Lohme. (For details see Light List.)

Jasmund Lightvessel.—A fixed white light, elevated 33 feet above the sea and visible 8 miles, is exhibited from the Jasmund Lightvessel, moored in about $13\frac{1}{2}$ fathoms about 2 miles east-north-eastward from Ranzow Lighthouse.

The vessel has two masts, each with a gaff, and a bowsprit. The foremast carries a red spherical day mark and the lantern. The hull is painted red and marked Jasmund in white on each side.

Fog signals.—A horn, worked by compressed air, is sounded.

When the fog horn is disabled a bell is sounded continuously.

A submarine bell is also sounded at the lightvessel. (See Light List.)

The Jasmund Light Vessel is for the guidance of the ferry steamers between Sassnitz and Trelleborg.

The light vessel is liable to be withdrawn without notice being given. A riding light is carried.

Stubbenkammer—Fog signal.—On the Stubbenkammer Cliffs, about $1\frac{1}{4}$ miles southeastward of Ranzow Lighthouse, during thick or foggy weather, when the Jasmund Light Vessel is off her station, a compressed air siren is sounded. (See Light List.)

Storm signals are shown from a station near the fog-signal stand on the Stubbenkammer Cliffs.

Light—Kollickerort.—A flashing red light, elevated 98 feet above the sea, and visible 10 miles in clear weather, is exhibited from a white round iron tower, 21 feet high, with gallery and pointed roof, at Kollickerort, on the east side of Jasmund Peninsula, nearly 2 miles southeastward of Ranzow Lighthouse. For arc of visibility, see Light List. Unwatched.

Jasmund Rock, with 7 feet water over it, and a depth of 12 to 18 feet close around, lies 400 yards from the shore abreast Kollickerort Lighthouse; at $\frac{1}{2}$ mile southeastward from the light is a patch of 3 fathoms, close to the 5-fathom line.

Buoy.—A white buoy, marked "Jasmund O.," with topmark of two triangles, bases toward each other, is moored about 600 yards from the shore on the eastern side of Jasmund Rock.

Clearing mark.—When approaching this part of the coast, keep Cape Arkona Lighthouse well open of Königstuhl to avoid Jasmund Rock.

Wreck.—The wreck of the steamer *Hermann* lies sunk in 5 fathoms $\frac{3}{4}$ mile south-southeastward of Kollickerort Light. A green light buoy, showing an occulting green light every 5 seconds, thus light 4 seconds, eclipse 1 second, is moored about 75 yards east-southeastward from the wreck.

Sassnitz Harbor is formed by two piers. The east pier extends, with several curves, southwestward nearly in line with the shore for a distance of about 1,466 yards. The west pier lies north-northwestward of the east pierhead, and extends in an east-southeastern direction for about 230 yards from the shore, the pierhead being distant about 270 yards 351° from the outer end of the east pier. The width of entrance between the west pierhead and the east pier is about 125 yards, and the depth $3\frac{1}{2}$ fathoms.

The depth before the entrance eastward of the dredging limit is 4 fathoms; in the southwestern part of the harbor 3 to $3\frac{3}{4}$ fathoms, with 2 to $2\frac{3}{4}$ fathoms in the western corner by a landing stage; and in the northeastern part of the harbor $2\frac{1}{2}$ to $1\frac{1}{2}$ fathoms, shoaling toward the northeastward.

On the land side northeastward of the entrance are two berths with pontoon chambers for the railway ferry steamers. In the inner part of the harbor, near the harbor office, is a wooden pier for steamers. To the eastward outside the harbor is a motorboat pier. A landing stage in the corner of the harbor by the west pier is at the end of an aerial tramway.

The space between a line joining the west pierhead and the western angle of the western ferry berth, and a line joining the east pierhead and the southern angle of the new quay, must always be kept clear for the passage of the ferry steamers. The harbor is free from ice longer than the navigable waters in the vicinity of Rügen.

Anchorage.—The best anchorage in Sassnitz Road is abreast the town in from $6\frac{1}{2}$ to $7\frac{1}{2}$ fathoms.

Prohibited anchorage.—Vessels must not anchor in the space described above as to be kept clear for ferry steamers, except in case of necessity.

Anchorage westward of a line joining the west pierhead and the western angle of the western ferry berth is only by permission of the harbor master, with exception before mentioned.

Outside the harbor vessels must not anchor where they may cause obstruction to the ferry steamers when entering or leaving.

Rocks, with a depth of 6 feet over them, lie nearly 800 yards 153° from Sassnitz Church. They are covered by the sector of red light from the lighthouse on the east pier.

Lights—East Pier.—An occulting light with white, red, and green sectors, elevated 41 feet above the sea, is exhibited from a cylindrical iron tower 49 feet high, lower part white, upper part red, situated on the outer end of the east pier. The white, red, and green lights are visible 12, 9, and 7 miles, respectively. (For details, see Light List.) Unwatched.

Fog signal.—In thick or foggy weather a fog horn, worked by compressed air, on the end of the east pier is sounded.

(For details see Light List.)

West Pier.—A fixed red light, elevated 33 feet above the sea, and visible 6 miles, is shown on the west pierhead from a red-brown triangular iron framework.

Fog signal.—During thick or foggy weather, when the ferry steamers are entering or leaving, a double bell will be sounded. The bell is at an elevation of 34 feet, on the light structure on the west pierhead. (See Light List.)

Harbor lights.—Two orange lights, occulting, lead into the eastern ferry berth, and two orange lights, group occulting, lead into the western ferry berth. These orange-colored leading lights are shown only on the arrival and departure of the railway ferry steamers.

Fixed violet lights are shown at the outer ends of the center and eastern ferry piers.

A fixed green light is shown from the end of the steamboat pier in the northeastern part of the harbor.

A group occulting red light is shown 49 feet above the sea from a lattice elevating mast on the land about 328 yards northward of the light on the end of the west pier, and in line with it leads 70 yards westward of the east pierhead. This group occulting red light is shown only when the lightbuoy outside the harbor is removed on account of ice when the ferry steamers are entering.

Fog signals.—The berth to which the in-coming railway ferry steamer is to proceed is indicated during thick or foggy weather by the following signals, made by an electric bell:

To enter the eastern berth, a series consisting of rapid strokes during 3 seconds, silence 1 second.

To enter the western berth, a series consisting of rapid strokes during 3 seconds, silence 1 second, rapid strokes during 8 seconds, silence 1 second.

Light and bell buoy.—A black bell buoy, marked "1," showing a group occulting white light, having 2 eclipses every 12 seconds,

is moored on the western side of the entrance channel, 1,100 yards 210° from the lighthouse on the east pier.

Buoys.—Two black conical buoys, marked “2” and “3,” respectively, the inner buoy “3,” with a ball top mark, also mark the west side of the entrance channel to Sassnitz. The inner buoy lies about 150 yards westward of the east pierhead.

A red can buoy lies in the middle of the eastern part of the harbor, about 150 yards southwestward of the end of the wooden pier for steamers.

Dredger.—Dredging is in progress off the entrance to Sassnitz Harbor. The dredgers show, on the side to be passed, a red ball by day and a red over a white light at night, and on the other side a white light at night. The dredgers’ deposit ground is in 12 fathoms about 2½ miles eastward of the light buoy.

Pilots.—Pilotage is compulsory for merchant vessels with over 60 cubic meters clear hold space. Vessels should hoist the pilot flag when approaching and wait in the road till the pilot comes on board. A pilot is sent by the harbor master to a vessel leaving.

Directions.—The light structure on the west pierhead, in line with the lattice light mast on the land to the northward, leads through the dredged channel to about 200 yards from the west pierhead, leaving the black buoys to port.

At night steer for the light buoy off the entrance and, when approaching it and while within the white sector of light from the east pierhead, turn to the northward toward the entrance to the harbor and steer for the fixed red light on the west pierhead on a bearing about 14°, or in line with the group-occulting red light to the northward, if shown, until abreast the east pierhead; from here steer midway between the west pierhead and the east pier into the harbor.

Sassnitz (Sasznitz) is situated in a valley which leads from the shore to the plateau. This town and Crampass Village, a short distance to the westward, are two favorite watering places. Lanken (Lancken) Castle, a large white building with two square towers, stands on the high ground about 1 mile westward of Sassnitz.

Communication.—There is direct railway communication with Berlin via Stralsund, and by railway ferry steamers with Trelleborg in Sweden. In summer there is communication with Swinemünde, Greifswald, and Bornholm by steamer.

Radio station.—There is a radio station at Sassnitz. Call letters K C V.

Supplies.—Provisions and water can be obtained; the latter in any quantity by hose, on payment, but notice beforehand is necessary to the authorities.

Coal.—Provision is made for storing about 1,000 tons of coal. About 600 tons are in stock, Silesian and Westphalian.

Repairs.—Small repairs to vessels and machinery can be carried out.

Trade.—The principal articles of import and export are coal, building stone, and timber.

Storm signals.—The signal mast stands near the harbor office, at the northeastern end of the harbor.

A mast with signal arm at the ferry berths is used only for communication with the ferry steamers.

Important notices to mariners are posted up at the harbor office.

Life-saving.—There is a rocket apparatus at Sassnitz.

Prorer Wick, situated between Sassnitz and Granitzer Ort 7 miles southward of it, is 3 miles deep, with a depth of 7 to 9 fathoms, clay, in the northern, and fine gray sand and shells in the southern part, decreasing gradually to 4 fathoms within $\frac{1}{4}$ mile of the head of the bay, which is formed by a low sandy isthmus named Schmale Heide (Narrow Heath). Inside the 3-fathom curve the ground is foul.

Granitzer Ort, the southern entrance point of the bay, is high and wooded.

Seehunds Riff—Buoy.—Seehunds Riff, extending from Granitzer Ort about 600 yards in a westerly direction, is marked off its northwestern side by a white spar buoy, marked "Granitz N.," with a topmark, two red triangles, apex upward. Within this reef small vessels may obtain sheltered anchorage in 9 to 14 feet water.

Anchorage may be obtained in the northern part of Prorer Wick, abreast Neu Mucran, but should only be used with offshore winds.

Telegraph beacons.—Near Neu Mucran, on the shore of Prorer Wick, about 3 miles southwestward of Sassnitz, two green beacons mark the landing place of the German-Swedish cable. The front beacon has a triangle and the rear beacon a square as topmark, on which is a white "T." Vessels are forbidden to anchor in the vicinity of the cable.

Binz, in the southern part of Prorer Wick, about $1\frac{3}{4}$ miles westward of Granitzer Ort, is a watering place with large hotels conspicuous from seaward. A landing pier, 623 yards long, extends northeastward from the shore, with a depth of 16 feet at the outer end. Anchorage may be had on either side of the pier. There is a railway station on the Göhren-Putbus Line.

Life-saving.—A lifeboat and rocket apparatus are stationed at Binz.

The coast from Granitzer Ort trends southeastward 5 miles to Peerd Point (Nord Perd), thence in a south-southwest direction $4\frac{1}{2}$ miles to Thiessow Höft, the southern extremity of Rügen Island. Between Granitzer Ort and Quitzlasier Ort, $1\frac{3}{4}$ miles southeastward

of it, the shore is high and cliffy, thence to Peerd Point it is covered with small sand hills and plantations.

Sellin, a summer resort, is situated on the north side of Quitz-laser Ort. A pier has been constructed, and, during the season, the fairway up to the pier is marked by red spar buoys on the star-board and black conical buoys on the port side. The channel can only be used by those with local knowledge, notwithstanding the buoys. There is a railway station on the Göhren-Putbus Line.

Shoals—Buoys.—About $\frac{1}{2}$ mile northward of Quitz-laser Ort and extending 1,200 yards from the shore there is a reef with 3 feet least water, marked on its northeastern edge by a white beacon buoy with a top mark, two triangles, bases toward each other, marked "Quitz-las O.," and on the southeastern side by a white spar buoy surmounted by two triangles, points downward, and marked "Quitzlas S." There is a depth of 4 to 5 fathoms close around the reef.

A white spar buoy, with top mark of two triangles, bases together, and marked "Sellin O.," is moored off the edge of the shoal extending from Quitz-laser Ort.

Peerd Point (Nord Perd) is a high, wooded promontory with steep clay sides; on the highest part there is a bare hillock. The water tower at Göhren is conspicuous.

Piers.—On the northern side of Peerd Point there is a small landing pier for sailing and motor boats. On the southern side of the point is a large pier for the bathing traffic, 1,094 yards long, with a depth of 16 feet at the outer end.

Buoys.—Peerd Point is surrounded by a reef, the eastern edge of which is marked by a white spar buoy with top mark of two triangles, bases toward each other, and marked "Göhren O.," in $3\frac{1}{2}$ fathoms; about 1,400 yards northwestward of this point, about 400 yards from the beach, lies a rock named Buhskam, 3 feet above water, close to the 3-fathom curve.

Southward of Peerd Point lies a white spar buoy marked "Göhren Süd.," surmounted by two upturned brooms.

Göhren is a watering place with a conspicuous hotel, in the neighborhood of Peerd Point. It is the terminus of the railway to Putbus, and is a telegraph station.

Light.—A fixed white light, elevated 31 feet above the sea and visible 4 miles, is exhibited on the northeastern corner of the head of the pier southward of Peerd Point. The light is not exhibited when Greifswald Bodden is blocked by ice.

Ice signals.—A horizontal cylinder, with conical ends, hoisted at the head of the signal mast on the high land at Göhren, signifies that navigation in Greifswald Bodden is endangered by ice.

Life-saving.—A lifeboat and rocket apparatus are stationed at Göhren.

Storm signals are shown at the highest part of Peerd Point.

Coast.—Southward of Peerd Point the shore is low and sandy for a distance of 2 miles to Lobber Ort, which is somewhat higher, with steep clay sides; thence the shore continues low and sandy to Thiesow Höft. Great (Gross) Zicker, Klein Zicker, and Thiessow Höft are high and appear as islands when at some distance.

Shoals—Buoys.—Nearly 1 mile east-northeastward of Lobber Ort lies Iduna Grund, with 2 fathoms water, and 3 to $3\frac{1}{2}$ fathoms close around; a white spar buoy, marked "Iduna Grd. O.," and surmounted by two triangles, bases toward each other, is moored on the eastern side of the shoal.

About $\frac{1}{2}$ mile southeastward of Lobber Ort lies a rocky patch of 4 feet least water close to the 3-fathoms curve.

About 1 mile southward of Lobber Ort, and $\frac{1}{2}$ mile from the shore, is Damm Riff, covered with 2 feet, off the eastern side of which is moored a white buoy, marked "Dammriff O.," surmounted by a top mark of two triangles, bases together.

Thiessow (Thiessower) Höft (Süd Perd) is tolerably high with a steep declivity on its southern side, and sloping gradually to the low sandy beach on its northern side. Thiessow (Thiessower) Haken, a shoal with 1 to 2 fathoms of water, extends 2 miles south-southwestward from the point.

Anchorage.—With off-shore winds good anchorage may be obtained in a depth of $4\frac{1}{2}$ to 5 fathoms, fine sand, between Thiessow Höft and Peerd Point.

Stein Trendel (Thiessower Stein Trendel)—**Buoy.**—Two rocky shoals named Stein Trendel, with $1\frac{3}{4}$ fathoms least water, and a depth of 4 fathoms close around, lie $1\frac{1}{2}$ miles eastward from Thiessow Höft. A white beacon buoy, surmounted by a top mark, two triangles, apex upward, is moored northward of this shoal.

Clearing marks.—Peerd Point (Nord Perd) in line with the eastern extremity of Jasmund Peninsula, bearing 348° , leads eastward of Stein Trendel Shoal, as does Kröslin Church over Ruden Island, bearing 186° .

Stein Grund—Buoy.—About 3 miles eastward of Stein Trendel (Thiessower Stein Trendel), and over $2\frac{1}{2}$ miles 296° true from the lighthouse on Greifswald Oie, is Stein Grund, with $2\frac{3}{4}$ fathoms over it; a white spar buoy marked "Steingrund N.," surmounted by two triangles, points upward, lies on the northern side of the shoal.

Telegraph beacons.—A submarine cable is laid from a point 600 yards northwestward of Thiessow (Thiessower) Höft to Greifswald (Greifswalder) Oie; two telegraph beacons, in line, show the direction near which vessels should not anchor. Two other beacons are erected on the southernmost point and show the direction of the cable to Ruden Island (Der Ruden).

Thiessow Village lies on the southern point near Thiessow Höft. It is a telegraph station; a telephone is at the pilot lookout. On the east beach there is a landing pier about 340 yards long, with a depth of 11 feet at the outer end.

Pilots reside at Thiessow Village on the western side of the point, and a lookout is kept on the highest part of the point. Pilots can be obtained for Sassnitz, the Land Tief, Ruden, Greifswald Bodden, Peenemünde, Greifswald, Stralsund, and Lauterbach. Pilotage is compulsory for merchant vessels proceeding from sea by Land Tief or Ost Tief to Lauterbach, Stralsund, Greifswald, and Peenemünde, from Peenemünde to Wolgast, and from these places to sea; exceptions are, vessels under 210 cubic meters hold space for the Peenestrom to Wolgast, and vessels under 200 cubic meters for all other compulsory pilotage channels.

When a vessel approaches flying the pilot signal the German merchant ensign is hoisted at the pilot lookout, to show that the signal is seen, whereupon the pilot boat proceeds to meet the vessel outside the Stein Trendel (Thiessower Stein Trendel) shoal. The pilot steamer, in strong easterly winds, meets vessels at any distance off, as soon as the pilot signal is made out. If the pilot is unable to go out on account of ice or bad weather, the signal T.J.P. of the International signal book, "Pilot can not get away," is hoisted at the lookout.

Water level.—With strong southwesterly winds the water may fall $3\frac{1}{4}$ feet below, and with strong winds from the opposite direction may rise to $6\frac{1}{2}$ feet above mean level. Exceptional variations occur several times in autumn, winter, and the first half of spring.

Signals with the International Code are made at the flag-staff near the pilot tower.

Storm and tide signals are shown at Thiessow Höft (Süd Perd) (Thiessower Höft).

Life-saving.—A lifeboat and rocket apparatus are stationed at Thiessow, on the east coast, and a lifeboat on the west coast.

Greifswald (Greifswalder) Bodden.—In the entrance of this bay, which lies between Thiessow Höft and the northern extremity of Usedom, 6 miles southward of it, there is an extensive sand flat with only 4 feet water over it in some parts, which rises gradually on the seaside, but is steep toward the bodden; the southern and northeastern parts of this bank inclose Ruden and Greifswald Islands. On the line joining these islands the bank reaches its greatest breadth of about $8\frac{1}{4}$ miles within the 3-fathom curve. Two channels, the Land Tief and Ost Tief, cut through the bank and are kept open for navigation by dredging.

Greifswald Bodden is about 13 miles in extent, with general depths of $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms; in the northeastern part there are depths of 5

and 6 fathoms in places; in the eastern part there are numerous shoals composed of sand and gravel; those lying near the fairway are buoyed. The southern shore of the bay is low and tolerably free from dangers; the northern shore, which is formed by the south part of Rügen Island, is composed of precipitous cliffs and valleys with numerous projecting points and islands. Along this shore there are several shoals and reefs with deep water between. In the western part of the bay lies the entrance to Stralsund Channel, which separates Rügen Island from the mainland.

Landmarks.—On Rügen, the hunting seat at Granitz; the monuments at Gross Stresow and Neukamp; the churches of Vilminitz and Bergen, with pointed steeples; Lauterbach Mill; Casnevitz (Kasnewitz) Church, with pointed, and Garz Church, with blunt tower; and Göhren Water Tower. On the mainland, the churches of Neuenkirchen, Greifswald, Wiek (Wieck), Wusterhusen, Kröslin, and Wolgast.

Ice.—Greifswald (Greifswalder) Bodden is covered with ice as a rule in January and February. Drift and ground ice sometimes drift about for weeks, till a calm occurs, when they freeze together. During the melting of the ice, which goes on very gradually, a gale from southwest or west can clear the bodden of ice within 24 hours. Ice bars sometimes form on the shoals on both sides of the dredged channels in Land and Ost Tiefs, as well as at Palmer Ort, and on all the shoals.

Navigable depths.—The least depths in the approaches to Greifswald Bodden and ports within it are as follows: Land Tief, 16½ feet; Ost Tief, 20 feet; Wiek (Wieck) and Greifswald, 13 feet; Lauterbach, western entrance 16½ feet, eastern entrance 12 feet; Stralsund, 15½ feet; and Wolgast, on the Peene River, 16½ feet.

Land Tief, a dredged channel 1½ miles long northeast and southwest, and from 66 to 76 yards wide, with a depth of 16½ feet, passes through the sand bank between Thiessow (Thiessower) Haken and Ruden Island (Der Ruden).

Buoys.—A distinguishing buoy lies at each end of the Land Tief; the eastern is a red and black beacon buoy with ball topmark and upturned broom over, and marked "Landtief O." on a white board; the western is a red beacon buoy, marked "Landtief W." surmounted by an upturned broom. The channel is buoyed on both sides.

Directions.—From the northward approach with Kröslin Church over the middle of Ruden Island, or when the church is not visible, toward Ruden on a 188° course, until the southern point of the peninsula at Thiessow is abeam; then steer 261° toward the distinguishing buoy. Vessels can also pass westward of Stein Trendel, when the buoy may be approached by keeping Teschenberg, in the northern part

of the Mönchgut Peninsula, open eastward of Thiessow Höft. Steer through Land Tief between the buoys.

Greifswald (Greifswalder) Oie lies $7\frac{1}{2}$ miles southeastward from Peerd Point (Nord Perd), and stands on the northeastern extremity of the flat which divides Griefswald Bodden from the sea. The island is $\frac{3}{4}$ mile long northeast and southwest and 700 yards broad at its northeast end; the coast has a greatest height of 82 feet.

Shoal water under 3 fathoms extends nearly $\frac{1}{2}$ mile northward and eastward from the lighthouse, and 1.6 miles, 37° from the lighthouse is a stony shoal of 23 feet water; vessels of deep draft should on no account approach the island nearer than 2 miles.

Beacon.—A wooden beacon, with quadrangular top mark, 41 feet high and 87 feet above the sea, stands about 700 yards within the southwestern point of the island.

Fishing Harbor.—Near the southwestern end of the island, which terminates in a point, there is a boat harbor 350 yards long and 153 yards wide, with a depth of $8\frac{3}{4}$ feet. It is protected by a north and a south mole and by a breakwater between; there is an entrance at the northwestern angle, with a depth of $9\frac{3}{4}$ feet, and at the southwest angle, with $2\frac{1}{2}$ feet.

Buoy.—A small white spar buoy, with a top mark of two up-turned brooms, marks a rock lying 175 yards, 306° , from the north molehead. It is left on the port hand when entering the harbor.

Lights.—On the northeastern point of Greifswald Oie stands a red octagonal lighthouse, 120 feet high, from which is exhibited a flashing white light, elevated 159 feet above the sea and visible 19 miles. (For details see Light List.)

Fog signal.—A siren, worked by compressed air, situated 66 yards eastward from the lighthouse, is sounded.

Reserve light.—An alternating light is exhibited, 71 yards 51° from the lighthouse, from a small gray circular lantern, surmounting a brown wooden truss, when for any reason the flashing light (which is still exhibited experimentally) can not be shown (1915).

From the north molehead of the harbor a fixed red light is exhibited at an elevation of 23 feet above the sea from March 15 to December 1, except when the harbor is closed by ice. **Unwatched.**

Signal and telegraph station.—At the lighthouse on Greifswald (Greifswalder) Oie, and there is telegraphic and telephonic communication by cable to Thiessow.

Storm signals are shown day and night from a signal mast standing 82 yards northeastward of the lighthouse.

Pilots are not stationed on Greifswald Oie, but they can be summoned from Thiessow or Ruden Island by telegraph from the lighthouse for vessels flying the pilot signal.

Life-saving.—A rocket apparatus is stationed on Greifswald Oie, near the fishing harbor.

Telegraph beacons.—Two beacons on the southwestern side of the island, in line, mark the direction of the telegraph cable to Rügen Island. Vessels are forbidden to anchor in the vicinity of the cable.

Anchorage.—There is anchorage in 4 fathoms, about $\frac{3}{4}$ mile southeastward of the lighthouse.

Oier Riff extends about 2 miles in a southwesterly direction from Greifswald Oie. The reef dries 1,200 yards from the island; thence to its southwestern extremity there are depths of 2 to 9 feet, deepening suddenly to 18 feet. The southern part of the reef is called Ellenbogen, and a spur from it extending southwestward, with a depth of 3 fathoms, contracts the entrance to Ost Tief. A red spar buoy marks the southern side of the reef.

Ruden (Der Ruden), situated 1 mile north of the northern end of Usedom Island, is about $1\frac{1}{4}$ miles long north and south, nearly $\frac{1}{2}$ mile broad at its northern end, and terminates in a low point at its southern end, close to which there is a depth of $5\frac{1}{2}$ fathoms.

Leading beacons.—Between the houses and a small plantation on the northern end of the island there are two beacons which, in line, point to the fairway buoy at the entrance to Ost Tief. The western consists of a spar with a barrel on top, and the eastern has a small triangle over a large one, points upward, and painted red.

In about the middle of the island stands a pole beacon, surmounted by a white triangle, point downward, and northeastward of it a beacon with a triangular top mark, the apex of which is 41 feet above mean water, has been erected in about 11 feet of water 300 yards from the western beacon. The base is formed by a truncated rock cone, and above that a four-sided red brickwork prism, on which stands a gray iron platform with railings, which supports a cylinder with cone-shaped roof painted red. These beacons in line lead through Ost Tief.

Telegraph beacons.—From the western side of the island, abreast the northern beacons, a telegraph cable is laid to Rügen Island. Two beacons in the northern part of the island in line indicate the landing place of the cable and two beacons in the southern part the direction of the cable from where it takes a turn at a point $\frac{3}{4}$ mile from the shore. Vessels should not anchor on or near the line of either pair of beacons.

Two beacons on the south end of the island mark the direction of the cable from Ruden to the mainland.

Fishing light.—An occulting white and red light elevated 28 feet, is exhibited from the eastern of the two beacons situated near the center of the island of Ruden. (For details see Light List.) Unwatched.

Pilots reside on the northern part of Ruden (Der Ruden); they meet vessels outside the Fairway Buoy of the Ost Tief, and pilot vessels to the various places.

There is a telephone in the chief pilot's house.

Tide signals are made from a mast near the pilot tower; signals by International Code are also made.

Life-saving.—A lifeboat is stationed at Ruden.

Fresendorf (Freesendorfer) **Haken**, with 1 to 6 feet water, extends 1.6 miles northward from the point on the western side of the entrance to the Peene River southwestward of Ruden.

Buoy.—At the northern edge of Fresendorf Haken, which is steep-to, a black beacon buoy, marked "Fresendorf N.," surmounted by a ball under an upturned broom, is moored in a depth of $3\frac{1}{4}$ fathoms.

Light.—From a small iron house, on a masonry base, near the northern end of Fresendorf (Freesendorfer) Haken, an alternating red and white light is exhibited 20 feet above the sea and visible 6 miles. Unwatched; discontinued when the channels are obstructed by ice. (For details see Light List.)

Peenemünd (Peenemünder) **Haken**, with less than 1 fathom on it, consists of hard sand, and extends $2\frac{1}{4}$ miles in a northeasterly direction from the northernmost part of Usedom, which is low, and covered with a plantation named Peenemünde Forest. The part between this forest and the sea consists of low meadow land, and near the coast it is overgrown with reeds and rushes.

Gänse Grund, with depths of 2 to 3 fathoms, extends 1 to 2 miles from the eastern side of Peenemünd Haken.

Steintrendel (Usedomer Stein Trendel)—**Buoy.**—Eastward of Gänse Grund and 4 miles 198° from Greifswald Oie Lighthouse lies a small rocky shoal named the Steintrendel (Usedomer Stein Trendel) with $1\frac{3}{4}$ fathoms water and 3 fathoms close around; a white beacon buoy, marked "Usedom O.," with top mark of two triangles, bases toward each other, is moored on the eastern edge of this shoal. A shoal about 800 yards long and 200 yards broad, with a depth of $4\frac{1}{4}$ fathoms, is situated 3.7 miles eastward of the Steintrendel, and about $4\frac{1}{2}$ miles 148° from Greifswald Oie Light.

Ost Tief.—The entrance to Ost Tief, with $3\frac{1}{4}$ fathoms in the channel, lies between Gänse Grund on the south and Oier Riff and the large sand bank in front of Greifswald Bodden on the north. Between the two sides, which are from $\frac{1}{2}$ to 1 mile apart, lie, on the northern side of the channel, a spur from Ellenbogen at the southwestern end of Oier Riff, with 3 fathoms on it, and Veritas Grund with $2\frac{1}{4}$ fathoms. Dredging is in progress.

The Ost Tief, a dredged channel about $\frac{3}{4}$ mile long in a 60° and opposite direction, 55 yards wide, and 20 feet deep, connects the

entrance with the channel on the east side of Ruden, which leads round the south point of that island and through the loch into Greifswald (Greifswalder) Bodden.

Buoys.—A black and red beacon buoy, with ball under an up-turned broom, marked "Ost Tief O.," is moored off the eastern entrance to Ost Tief, as a Fairway buoy, with the beacons on the northern end of Ruden in line.

The entrance and the dredged channel are buoyed.

Veritas Grund is marked on the southeastern and western sides by a black and red beacon buoy with cross topmark and on the southern side by two small red spar buoys.

A gray can buoy marked "Ruden," with ball topmark, lies in Ruden Anchorage eastward of that island.

Currents.—With winds between north and north-northeast, the current sets from south to southwest, and with strong winds in the above direction and low water level in the Baltic, it runs from 4 to 6 knots. With winds between east and west, through south, a current of 2 to 5 knots sets between north and northeast, and with winds between west-northwest and north-northwest, just as strongly between south and south-southwest. In a calm a strong current may run to the southwest at low water level in the Baltic, and to the northeast at high level.

Anchorage.—The two northern beacons on Ruden (Der Ruden) in line lead into the entrance to Ost Tief, in the outer part of which anchorage may be obtained in a depth of $3\frac{1}{2}$ to 4 fathoms during offshore winds.

The inner roadstead between Ruden and Peenemünd Haken affords good anchorage in $3\frac{3}{4}$ to $4\frac{1}{4}$ fathoms, mud, southward of the gray can buoy with ball topmark moored off the western entrance to Ost Tief.

The Loch, with depths of $3\frac{1}{4}$ to $5\frac{1}{4}$ fathoms, leads in a westerly direction from the roadstead eastward of Ruden to Greifswald Bodden. Between the sand flat west of Ruden and Tonnen Bank, a flat westward of Peenemünd Haken, the loch is about 600 yards wide, and narrows to 400 yards near Fresendorf Haken.

Directions for Ost Tief.—To make the entrance to Ost Tief steer 241° for Wusterhusen Church, which may be seen 16 miles off in clear weather. This course leads between Oier Riff and Steintrendel, off Usedom, toward the fairway buoy of the Ost Tief, which lies with the two beacons on the northern end of Ruden in line. Here a pilot may be waited for or the vessel anchored in 4 to 5 fathoms.

From the northward vessels should keep at least 1 mile from Greifswald Oie.

From the Fairway buoy steer 298° past the spur from Oier Riff, with 3 fathoms on it, and either northward or southward of Veritas

Grund, until the two beacons near the middle of Ruden are in line, which mark leads through the dredged channel between the buoys.

From a gray can buoy in Ruden Anchorage steer for the red spar buoy with ball lying off the southern point of Ruden, and leave it to starboard; then steer westward through the Loch between the buoys, gradually approaching the northern side of the channel until Kröslin Church is in line with Petri Church in Wolgast, bearing about 168° , when steer northward with this mark astern into Griefswald Bodden.

Shoals in Greifswald (Greifswalder) Bodden.—The shoals in the eastern part of Griefswald Bodden are separated from each other and from the large sandbank lying seaward of them, by depths of $3\frac{1}{2}$ to 7 fathoms.

On the northern side of the bay are several shoals of $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms lying southward and westward of Vilm Island. A dangerous rock, with 3 feet on it and depths of 13 feet around, lies about 700 yards eastward of Zudar Peninsula and close to the 3-fathom line; from it Palmer Ort and Konower Ort are in line.

Most of the shoals are named; for their buoyage and position the charts should be referred to.

Beacon.—A beacon, 34 feet high, is erected on Gross Stubber, a sandbank with large stones, which dries at low-water level.

Channels—Directions.—Greifswald Bodden is divided into two channels by the mass of shoals lying in its eastern part; the northern channel passes between Gräften Grund and Doretta Grund, the southern between Neptune (Neptun) Grund and Fresendorf (Freesendorfer) Haken into the bodden whence Griefswald and Stralsund are reached. Vessels whose draft requires more than $3\frac{1}{2}$ fathoms of water must proceed by the northern channel.

From Land Tief to the northern channel, when clear of Bottcher Grund, steer for Bergen and Vilumitz Churches in line until Göhren Water Tower appears on the northern side of Zickersches Höft, when turn to the southwestward with that mark astern, which leads between Doretta and Gräften Grund. The shoals are buoyed.

From the Loch to the northern channel, steer 348° with Kröslin Church in line with Petri Church in Wolgast, astern, and then for Zickersches Höft on a 336° bearing until the eastern buoy of Bottcher Grund is passed, when proceed as directed in the last paragraph.

From the northern channel through Greifswald Bodden, when between Doretta and Gräften Grund, if bound for Palmer Ort, steer 235° for Gristow Church. If bound for Daenische (Dänische) Wiek steer to pass westward of Orient Grund.

To the southern channel from Land Tief, steer 156° with the western side of Zickersches Höft astern till the southern buoy of the Schumacher Grund is passed, then southward of the buoys on

Neptune (Neptun) Grund and Elsa Grund into Greifswald Bodden. From the southern channel, through the bodden to Stralsund, steer 273° from the black beacon buoy on Fresendorf Haken, which course leads to the Fairway buoy of the Palmer Ort Channel, passing northward of the buoys on Elsa Grund and Ariadne Grund. Vessels that require more than $3\frac{1}{4}$ fathoms of water on account of their draft must use the northern channel.

Anchorage.—Klein Zicker Road has good anchorage in about $4\frac{1}{2}$ fathoms, with Bergen and Vilmnitz Churches in line, and a group of trees at Göhren in line with the east side of Klein Zicker.

Zicker See has in it a basin about 320 yards long, 60 yards wide, and 2 fathoms deep with dolphins at the sides, which is approached by a dredged channel 44 yards wide, and 13 feet deep, marked by buoys and pricken. Two beacons on the east shore of the see, in line, lead through the channel.

Beacons.—A beacon in the form of a pyramid stands on Reddevitzer Höft as a pilots' mark.

Seedorf, a village on the Lanckener Bek has a small shipbuilding yard, where wooden coasters are built and repaired. The depth at the steamer wharf is 13 to 14 feet.

Lauterbach Approaches.—Lauterbach, on the northern side of Greifswald Bodden, is approached by a western channel, with 16 $\frac{1}{2}$ feet, and an eastern with 12 feet, least water. The western is most used, and leads between the shoal ground extending from the shore between Zudar and Lauterbach, on the west, and Trendel Riff and Stein Riff on the east; the channel is buoyed. The eastern channel leads between the shoals off Reddevitzer Höft and Vilm Island to a narrow channel north of that island; there are rocks in the channel.

Buoys.—A black beacon buoy with upturned broom, and marked "Lauterbach," lying about $1\frac{1}{4}$ miles westward of the western extremity of Vilm Island, marks the port side of entrance to the western channel. A red beacon buoy with upturned broom, marked "Lauterbach O," lying nearly 1 mile eastward of the northern end of Vilm Island, similarly marks the eastern channel.

Lauterbach Hafen lies between two piers, the northern of which has railway lines on it, is higher and is carried out farther eastward than the southern pier. The entrance is marked by dolphins on both sides; the depth between the dolphins and off the sea wall at the northern end of the haven is $9\frac{3}{4}$ feet.

Light.—A fixed white light, elevated 17 feet above the sea, and visible 4 miles, is shown from a mast at the head of the southern pier as long as the harbor is free from ice.

Anchorage.—Vessels anchor in the direction of the line of the south pier, about $\frac{1}{2}$ mile from its head, in $3\frac{1}{4}$ fathoms.

Pilots.—Pilotage is compulsory for merchant vessels, see Thiessow. A pilot conducts vessels to the various places in Greifswald Bodden and to Stralsund.

Lauterbach Village, a watering place, has railway connection, via Putbus, with Bergen on the Stralsund-Sassnitz Line, and in summer there is communication, by steamer, with Stralsund, Greifswald, and some bathing places on the coast. There is a ferry to Vilm Island.

Directions.—To approach Lauterbach Hafen by the western channel from the eastward, after passing the buoy southward of Doretta Grund, steer 273° until the bathhouse on the shore eastward of Lauterbach is in line with Vilmnitz Church; then steer 351° until the same church is in line with the eastern end of the northern harbor pier at Lauterbach, and follow this mark as far as the spar buoy on the northwestern end of Stein Riff, when steer more eastward, leaving the black conical buoys to port, and anchor near the inner black buoy. Small vessels can follow the last leading mark until near the pier.

From the southward or southwestward pass about 1 mile eastward of Zudar until Vilmnitz Church comes in line with the east end of the northern pier at Lauterbach, when proceed as above directed.

To enter by the eastern channel steer with Bergen and Vilmnitz Churches in line as far as the white spar buoy "Reddewitz W.," whence steer with the monument at Gross Stresow in line with the second house from the left, in that place, until the red beacon buoy, with broom, lying eastward of the north point of Vilm Island, is reached, which, together with a red spar buoy northward of it, is left to port. At No. 4 black conical buoy of this channel turn to port and steer toward Casnevitz (Kasnewitz) Church through the fairway.

Approach to Greifswald.—The channel from Greifswald (Greifswalder) Bodden to Wiek (Wieck) leads between Gahlkow Haken and Salzbodden Grund into Daenische (Dänische) Wiek, thence through a dredged channel to Wiek and Eldena, which lie on opposite sides of the entrance to the Ryckfluss. Daenische Wiek and the Ryckfluss freeze over earlier than Greifswald Bodden. With winds from north to east, the water may rise more than $3\frac{1}{4}$ feet above, and with winds from south to southwest, may fall as much below mean water level.

Buoys.—A black beacon buoy, with ball topmark under an upturned broom, marked "Greifswald," lying about $1\frac{1}{4}$ miles north-northeastward of Wiek (Wieck) Church, is the Fairway Buoy for the channel to Wiek. The fairway is buoyed.

Anchorage.—There is good anchorage in Wiek Road in 2½ fathoms, with Wiek Church bearing 199°, distant from 1¼ to 1½ miles.

Storm signals are shown on the southern shore of Greifswald Bodden at Vierow, westward of Lubmin Village, a sea-bathing place.

Wiek (Wieck) Hafen.—Two stone moles are built out at the mouth of the Ryckfluss, forming an entrance 66 yards in width, the northern mole being the longer; there are piers for lying alongside. The depth in the harbor and in the dredged channel leading to it is 13 feet. A wooden drawbridge, with an opening 26 feet wide, crosses the Ryckfluss from Wiek to Eldena and closes the harbor to the southwestward; it is opened both during the day and at night.

Bridge signals.—The signal to open the bridge is a white flag at the fore or the sounding of a bell or steam whistle. If the opening is obstructed, two red balls are displayed on the south side of the bridge by day and two red lights at night. Should one red ball or one red light be shown, incoming vessels are cautioned that vessels from Greifswald are about to pass.

Light.—A fixed green fishing light, elevated 16 feet above the sea, and visible 5 miles, is exhibited from a white circular tower 13 feet high on the north molehead. It is unwatched.

Pilots can be obtained to conduct vessels to Stralsund, Lauterbach, Lanckener Bek, Thiessow, Ruden, and to and from Greifswald.

Wiek (Wieck) Village, on the northern side of the entrance to the Ryckfluss, is the outer port of Greifswald, with which place there is regular communication by steamer. There is a light railway to Greifswald and Wolgast.

Directions.—As soon as the towers of Greifswald are made out, keep them well open northward of the sheepfold of Little Ladebow Farm, or bring the town-hall tower northward of the Marien Church of Greifswald. This mark bearing 236° leads northwestward of Gahlkow Haken, the northern point of which is marked by a white spar buoy with two triangles, points upward, and is followed as far as the white spar buoy with two triangles, bases together, and marked "Wampen O," lying on the edge of the shoal water off Wampen, when a course 205° leads toward the Fairway Buoy of the channel and Wiek Church. When Ludwigsburg Chapel is abeam the channel buoys will be seen and course shaped between the two outermost. In Wiek Hafen the course is midway between the river banks.

The channel to Greifswald from Wiek, through the Ryckfluss, is 3 miles long; the course is midway between the river banks. The dredged channel is 27 yards wide and 13 feet deep.

Greifswald Hafen.—The harbor extends from the smoke-drying houses to the bridge over the Ryckfluss. On the southern side

are stone quays and sea walls 984 yards long, furnished with railway lines. On the southern bank is a 10-ton revolving hand crane. On the north side is a sea wall. The depth is 13 feet in the outer part and 9½ feet in the inner part of the harbor.

Greifswald, a county and university town, with 24,680 inhabitants in 1911, is situated on the south bank of the Ryckfluss, about 2½ miles from its entrance into Daenische (Dänische) Wiek on the southern side of Greifswald Bodden. The river is crossed by a bridge in the middle of the town, and on the northern side there is a ship-building yard. The industries are the manufacture of chemicals, machinery, oils, soap, and pianos. It is a shipping port of little importance.

Communication.—Greifswald has a railway station on the Stralsund-Stettin line; there is regular communication with Wiek, and in summer with watering places on the east and north coasts of Rügen.

The telegraph office is always open.

Repairs.—Small vessels are hauled up and repaired at the Spruthsche building yard. An engine factory builds small steamers, with engines and boilers, and makes iron castings up to about 4 tons.

Salvage vessel.—The Spruthsche Werft, in conjunction with a Copenhagen company, has a salvage steamer, the *Rügen*, with which salvage work is undertaken; telegraphic address, Spruth, Greifswald.

The vessel winters at Warnemünde.

Tugs.—Towing is performed by the passenger steamers on the river.

Supplies.—There are about 50 tons of coal in store. Water can be taken on board from the town supply by hose.

Hospital.—Seamen can be admitted to the University infirmary; there is a military hospital in the town.

Palmer Ort to Stralsund.—The channel is 14 miles in length; between the shoal off Palmer Ort and the Middle (Mittel) Grund runs a dredged channel 2,330 yards in length and 55 yards in width, with a least depth of 15½ feet, connecting Greifswald Bodden with the channel northward of the Middle Grund. The channel is widest between Stahlbrode and Glewitz Ferry, and becomes gradually narrower, lying about midway between Rügen and the mainland, as far as Stein Ort, and then turns northward, passing eastward and northward of Dänholm to Stralsund. The depth varies from 20½ feet to 8¾ fathoms; in the dredged channel to Stralsund Hafen the depth is 16½ feet.

The entrance to Glewitz Wiek, northward of Stahlbrode, is buoyed.

Westward of the Drigge Peninsula a buoyed channel named Ziegelgraben, with a least depth of 9½ feet, branches off and passes between Stralsund and Dänholm.

Beacons.—At Neuhausen, on Rügen Island, $1\frac{1}{2}$ miles northwestward of Palmer Ort, a stone beacon with cone top mark stands on the shore, and northwestward from it is a mast 38 feet high with square top mark; these beacons in line mark the Palmer Ort Channel.

On the shore southeastward of Drigge is a rectangular white pillar named "Lotsenschild"; this kept close eastward of a group of conspicuous poplars near the mansion on Drigge gives the direction of the channel from Prosnitz Schanze (fort) to northward of Devin Haken.

A high white beacon with triangular top mark stands between Altfähr and Little (Klein) Bandelwitz; on the Rügen shore southward of it, by Grahler Ferry, is a pilots' beacon. These two in line mark the western limit of the channel between Drigge and Dänholm.

On the mainland side a large white square beacon on the shore eastward of Reinberg, in line with the church (not easily seen) of that place, marks the northern limit of the channel for small vessels when approaching Palmer Ort.

A white beacon with triangular top mark stands on the shore of the bight near Devin, and in line with Brandshagen Church gives the direction of the channel past Stein Ort and through the Ziegelgraben, but does not clear a shoal named Klein Stromrücken.

Telegraph beacons.—Two beacons on the northeastern side of Dänholm mark the position of a telegraph cable, thence to Grahler Ferry on Rügen. Another cable laid from the southeastern side of Dänholm to the northwestern point of Drigge Peninsula is marked by one beacon on Dänholm and two on Drigge. Anchorage near these cables is forbidden.

Strong current cable.—A strong current cable is laid across the Ziegelgraben and the Stralsund fairway, passing across the latter from the middle of Dänholm to the Rügen side in a northeasterly direction. Its position is indicated on land by white tables marked with a zigzag arrow and the inscription "Starkstrom," "Nicht ankern"; and in the Stralsund fairway by two green spherical buoys marked "Starkstrom," one on each side of the channel.

Buoys.—A red beacon buoy, with ball topmark, marked "Palmer Ort," lies more than a mile southeastward of the point of that name, and is the fairway buoy for the Palmer Ort Channel.

A white spar buoy, surmounted by two triangles, points upward, and marked "Kooser Stein N.," lies about $1\frac{1}{4}$ miles southeastward of the Palmer Ort buoy and should not be mistaken for it.

The dredged channel by Palmer Ort and the channel northward from Middle (Mittel) Grund are buoyed.

A red beacon buoy with ball lies at the entrance of the harbor channel to Stralsund.

Beacon buoys up to the last named lie on the eastern side of the channel; entering from southward, red buoys are left to starboard and black buoys to port.

Four brown barrel buoys mark a dredger deposit place on the east side of the channel eastward of the southern end of Dänholm.

Lights—Palmer Ort Light Vessel, painted red, with "Palmer Ort" in large white letters on each side, is moored in a depth of 3 fathoms 1,800 yards southward of Palmer Ort, the northern entrance point of the channel leading to Stralsund. The vessel has one mast, with a yard, and exhibits 2 fixed white lights, vertical, 26 and 36 feet above the sea, visible 10 miles. An anchor lantern is carried. The vessel is removed on the formation of ice, and its place taken by a small red spar buoy; she is sometimes withdrawn from her station without any substitute being left in her place.

Fog signal.—During thick and foggy weather a bell is sounded. (See Light List.)

Tidal signals are made at Palmer Ort Light Vessel, showing the depths in the dredged channel.

Stahlbrode—Light.—On a wooden pole, at an elevation of 14 feet, on the south pierhead is exhibited a fixed red light, visible 3 miles. The light is intended for the use of fishermen and is exhibited from September 15 to April 1, as long as the harbor is free from ice. Unwatched. (For sectors see Light List.)

Stahlbrode is a fishing village with a harbor, in which the depth is 8 feet.

Dänholm—Rifle practice is carried out on Dänholm Island, close to the southern entrance to Stralsund Hafen. The danger zone, extending from $\frac{1}{4}$ to $1\frac{1}{4}$ miles southward of the island, and from the edge of the fairway to the western shore of the channel, is marked by four yellow barrel buoys, each carrying a small red flag.

When practice is in progress a red ball will be hoisted on a flag-staff situated on the butts at the southeastern extremity of the island; a red flag is also hoisted on the flagstaff at the ferry pier on Dänholm.

Stralsund Hafen, situated on the eastern side of the town, has four approaches and has an average depth of $16\frac{1}{4}$ feet in the northern and $9\frac{3}{4}$ feet in the southern part. The quay and sea wall are about 650 yards in length and furnished with railway lines. Navigation is generally open throughout the year.

The depth in the dredged channel, 130 feet in width, is $16\frac{1}{4}$ feet, but in spring and autumn there is sometimes a difference of $3\frac{1}{4}$ feet in level, gales from northeast causing high and those from southwest low water.

Important Notices to Mariners are shown at the harbor office.

Range lights shown at Stralsund consist of a front light, fixed with white, red, and green sectors, shown at an elevation of 16 feet

from a gray post 10 feet high on the east end of the ferry pier; and a read light, fixed red, shown at an elevation of 17 feet, 95 yards southward of the front light. Both lights are visible 2 miles in clear weather and in line lead through the harbor channel. (For sectors see Light List.)

White, red, and green lights are shown at various other positions for local purposes. (See Light List.)

Green lights are shown at the railway station at Altefähr, opposite, for the railway ferry between that place and Stralsund.

Fog signal.—In thick or foggy weather an electric bell is sounded at the landing places of the railway ferry steamers at Stralsund and Altefähr when the steamers are expected.

Storm signals are shown at the hafen on the Kaponniere, both by day and night. A box containing weather reports is kept at the harbor watchhouse, where telegrams concerning the direction and strength of the wind at Arkona are displayed in the window.

Life-saving.—A lifeboat is stationed at Stralsund.

Pilots.—A head pilot and five under pilots are stationed at Stralsund and pilotage for the hafen is compulsory; a pilot will board a vessel off the hafen on the usual signal being made.

Pilots conduct vessels to Thiessow, Ruden, and the various places in Greifswald Bodden, and also through the channel to the westward.

The pilotage charges from Thiessow or Ruden to Stralsund Roads are according to the size of the vessel and calculated on the net cubic capacity.

Tugs can be ordered from Stettin and Swinemünde; out-going small passenger and cargo steamers perform towing work.

Anchorage.—There is good anchorage abreast the town, outside the dredged channel into the hafen, in about 6 fathoms.

Direction—Palmer Ort to Stralsund.—From the Fairway Buoy off Palmer Ort steer for the light vessel, and after passing it turn in the direction of the beacons at Neuhagen, which lead through the channel as far as the red spar buoy 4, when the course should be directed by the buoys. The north side of the Middle Grund is well buoyed, and there is no difficulty in approaching to abreast Stahlbrode. From the black conical buoy off that place steer 294° to pass southward of the spar buoys off Goldberg and Prosnitz Fort. When in mid-channel, between the fort and Neuhof brick-works, keep the next black conical buoy a little on the port bow, and bring the pilots' beacon on the shore southeastward of Drigge on with the eastern side of a group of poplars westward of the mansion on Drigge, which leads between the two channel buoys northward of Sand Ort, a point on the southern side of the channel. Then steer to pass southward of the spar buoy off Stein Ort, the south point of Drigge Peninsula, and after passing it bring Brands-

hagen Church in line with the white beacon on the shore of the bight by Devin.

Small vessels can pass through the Ziegelgraben with the latter mark astern; large vessels, after passing Stein Ort, keep more northward to avoid the Klein Steinrücken, marked by a black conical buoy with the name of the shoal on it. After passing the red spar buoy opposite the last-mentioned buoy keep the pilots' beacon on the Rügen Side at Grahler Ferry open a little westward of the high white beacon behind it till the two black buoys eastward of Dänholm are passed, when steer mid-channel between that island and Grahler Ferry, and then for the red beacon buoy with ball at the entrance to the Stralsund Harbor Channel.

The beacon buoys lie on the eastern side of the channel; red buoys are left to starboard entering from the south and black buoys to port.

A description of the western approach to Stralsund will be found in H. O. Publication No. 141.

Stralsund, situated on the western shore of Stralsund Channel, about 13 miles within its entrance from Griefswald Bodden, is the capital of the district and had a population of 33,981 in 1911.

It is a small shipping port. Some of the principal industries carried on are the manufacture of cement, laquer, machinery, iron castings, and soap.

Communication.—There is communication by steamer with Lübeck, Rostock, Stettin, and Rügen Island, also by railway with all parts of Germany. The telegraph office is always open.

Coal and supplies.—About 2,000 tons of English and Westphalian coal are kept in stock; fresh provisions can be obtained and water from the town supply by hose.

Trade.—The chief exports are grain, cement, piece goods, stones, potatoes, sugar, and wood; imports are guano, coal, cement, grain, limestone, petroleum, stones, and building wood.

Repairs.—Small repairs to machinery and boilers can be executed by the Pommersch Iron Foundry and other firms; a crane will lift 25 tons. Patent slips, see Appendix I.

Hospitals.—Seamen are admitted to the town hospital, and there is also a garrison hospital.

Peene River.—The western branch of the mouth of the Oder River, named the Peene, is 29 miles long from the Tonnen Bank, southward of Ruden Island, to the Bock Grund in the Little Haff. It flows everywhere through low meadowland, and forms several large bays, of which Achter Wasser is the most important. The channel leads over numerous banks and shoals, on which the necessary depths are maintained by dredging. From the inner roadstead, eastward of Ruden Island, a narrow, buoyed channel runs in a south-

west direction, between Tonnen Bank and the Möven Ort Shoal, thence more southerly along Usedom Island shore, to the narrows at Peenemünde, between which and Fresendorf Point 2 miles northwestward, lies Spandowerhagen Bay, with 6 to 9 feet water. The Peene separates Usedom Island from the mainland, and forms the western approach to Swinemünde and Stettin, through the inland waters named Little (Kleines) Haff and Great (Groszes) Haff, together named the Stettiner Haff.

Dredged channels.—The dredged channels in the Peene have the following names and dimensions from north to south:

	Length.	Breadth.	Depth.
	<i>Yards.</i>	<i>Yards.</i>	<i>Fect.</i>
Tonnen Bank.....	383	44	18
Knaak Rücken (secondary channel).....	547	33	8½
Stein Rack.....	765	44	16½
Peenemünder Rack.....	1,422	44	18
Hollendorfer Rack.....	378	44	16½
Der Heerd und Mahlzower Krüs.....		44	16½
In front of Wolgast Hafen.....			17
Negenmark.....	1,021	44	8½
Moderort.....	5,950	44	7½
Elb und Bock.....		41	8½
From Elb und Bock to the entrance to Usedom.....	1,960	38	7½

The depths in the fairway of the Peene outside the dredged channels amount to from 16½ feet to 6½ fathoms between the entrance and Negenmark Channel, and thence to the Little (Kleines) Haff from 6½ to 24½ feet.

Current.—With winds from southeast, through south, to west, the current sets into Greifswald Bodden; with winds from northwest, through north to east, it sets toward the Stettiner Haff with a velocity seldom exceeding 2½ knots. It is strongest in the narrows by Peenemünder Schanze.

Pilots.—Peenemünder Schanze, on the right bank of the river, near Peenemünde Village, is a pilot station. Pilotage is compulsory for merchant vessels except for decked vessels of less than 210 cubic meters hold space. The pilots conduct vessels to Wolgast and seaward as far as Ruden. They meet vessels in the channel off the schanze.

Storm signals (day and night), are shown from a signal mast, 65 feet high, on the northwestern angle of Peenemünder Schanze.

Peenemünde Village is connected with Wolgast by telephone. There is a customs inspection station.

Kröslin Village lies southwestward of Pennemünde, on the left bank of the river, in a shallow bight. There is a telegraph station, and the place is connected by a light railway with Wolgast and Greifswald. Kröslin has a fish trade and fish curing and pickling establishments.

Buoys.—The seamarks lie mostly on one side only of the dredged channels and fairways; buoys alternate with prickens.

Directions.—The navigation of this channel, narrow and winding in parts, is difficult notwithstanding its being well buoyed, and a pilot should be taken. Vessels lying in the fairway often narrow the channel so much that accurate local knowledge is necessary to avoid touching the ground.

Wolgast Hafen lies between the town and a small island in front of it called the Schlossplatz, and also on the east side of that island, where it is 16 feet deep; between the island and the town the depth decreases gradually from 15 feet outside to 6½ feet inside. A drawbridge, with a passage 26 feet wide, divides the outer harbor, with about 875 yards of wharf, from the inner. A railway line runs on the town side of the channel to the outer harbor; on the quay at the outer harbor is a hand crane to lift 3 tons. Vessels drawing 15 feet can proceed as far as Wolgast.

Telegraph beacons on the eastern side of Schlossplatz Island and at the ferry on the opposite side of the river mark the position of the telegraph cable from Wolgast to Usedom; vessels are forbidden to anchor in the vicinity of the cable.

Water level.—The water level fluctuates irregularly, being influenced by the level in the Stettiner Haff and in the Baltic.

Pilots.—Pilotage is compulsory for merchant vessels for the Peene River between Wolgast and Peenemünde, except for those with less than 210 cubic meters hold space, if they are not over 7½ feet draft. Pilots conduct vessels seaward to Peenemünde and up the river to West Clün (Klüne). Important Notices to Mariners are hung up at the harbor office.

Wolgast, a town of some commercial importance, on the west bank of the Peene, has about 8,300 inhabitants. It has railway communication with Stralsund and Stettin, and also with Heringsdorf from the ferry on the opposite side of the river, and by light railway with Kröslin and Greifswald. The telegraph office is always open.

Supplies.—About 50 tons of coal can be had, delivered alongside in railway wagons. Good water is delivered alongside in casks.

Repairs.—Wooden boats and coasters can be repaired at a ship-building yard on Schlossplatz. For patent slips, see Appendix I.

Tugs can be ordered from Swinemünde.

Trade.—In 1912 the principal imports were guano, dye woods, boards, chalk, grain, coal, granite, and lime; exports were dyewood extract, sulphates, grain, potatoes, wood, and cement.

Life-saving.—A lifeboat is stationed at Wolgast Hafen, near the ferry.

Wolgast to Lassin.—Southward of Wolgast, the fairway lies in about the middle of the river as far as Negenmark dredged channel.

Achter Wasser.—The Achter Wasser is an extensive sheet of water on the eastern side of the Peene, separated from the sea by a narrow ridge of land with an embankment. Shoal water extends some distance from the shore in several places; in the middle of the entrance is Hohe Schaar, a rocky shoal with 1 foot of water on it.

Depths.—The entrance between Gnitz Promontory and Liepe Point (Lieper Winkel), passing eastward of Hohe Schaar, has $2\frac{1}{4}$ to $2\frac{3}{4}$ fathoms; the channel to Störlang (Störlanke), $1\frac{1}{4}$ fathoms, and in the southern part of the Achter Wasser the depths are from $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms.

Buoys.—The entrance to the Achter Wasser, eastward of Hohe Schaar, is buoyed on both sides from that shoal to the southern point of Görmitz Island; thence to Störlang (Störlanke), a light on the northwestern side of Achter Wasser, near Zinnowitz, the channel is buoyed on one side only.

Lassin to Anklam.—Southward from the entrance to Achter Wasser, the channel follows along the east bank of the river at a distance of about one-third of the river's width, and is marked by buoys and pricken, as far as Moderort Dredged Channel, which is well buoyed.

After passing Moderort Channel the course is midway between the river banks as far as the buoys off the mouth of the Peene Fluss, when the course is directed by them.

The Peene Fluss flows through low meadow lands. An island lies before the entrance, dividing it into two branches; in front of the northern branch (the Peene proper) is a bar with 8 feet of water on it. The southern branch is named Richtgraben, and has a least depth of 11 feet; the channel lies through it. From the entrance to Demmin, a town 34 miles up stream, the depth is not less than 13 feet, and thence to Malchin, $4\frac{1}{2}$ feet. Between the entrance and Demmin the river is bridged at Anklam, Jarmen, and Loitz.

Directions.—When between Grosse Ort and Janken (Jahnken) Ort, the two small beacons on the southern bank of the Richtgraben come in line, when turn nearly 8 points out of the Peene into the Richtgraben and follow the direction of the beacons, leaving three spar buoys to starboard and a black conical buoy to port. Local knowledge is necessary to proceed to Anklam.

Anglam Hafen begins inside the railway bridge which crosses the river below the town. The wharf is 383 yards long and the berthing place has 11 feet alongside. The railway bridge and two others across the river have openings in them 37 feet in width.

Anglam, a town on the right bank of the Peene, has about 15,000 inhabitants. It has a railway station on the Stralsund-Stettin Line, and there is regular communication by steamer with Demmin and Stettin.

Pilots.—A pilot takes vessels to Stettin, Ückeründe, Swinemünde, West Clün (Klüne), and Wolgast.

Tugs are obtained from Stettin; the freight steamers on the Peene also perform towing.

Repairs.—There is a yard where small wooden vessels are built and repaired, and a patent slip where vessels up to 8½ feet draft can be hauled up. There is a large engine factory and an iron foundry, where casting and forging up to about 5 tons is done. Repairs to vessels, machinery, and boilers can be carried out.

Water is obtained from the river.

Camp (Kamp) is a village on the southwestern bank of the Peene, near where the Ducherow-Swinemünd Railway Bridge crosses the river. Carnin (Karnin) Station on Usedom is distant about 875 yards from Camp.

The railway swing bridge has an opening 51 feet wide, which is closed—

(a) From 20 minutes before the arrival of a train until it has passed.

(b) When the channel under the bridge is closed by ice.

(c) From October 1 to March 1, during the night, or from 10h. 15m. p. m. to 5h. 30m. a. m.

Signals.—Bridge closed.—By day a green ball on a signal staff on the head of each of the two bridge piers.

At night and in fog also by day, a red light in each of the above positions.

Bridge open.—By day, the two green balls are lowered.

At night and in fog also by day, a green light in each of the above positions.

Telegraph cable.—Vessels must not anchor within 110 yards of the bridge on either side of it on account of the telegraph cables.

Tugs.—Two steamers take it in turns to tow through the bridge.

Camp (Kamp) to **Little** (Kleines) **Haff.**—The channel is lighted and buoyed.

The channel to Usedom branches off in a northerly direction from the dredge channel Elb und Bock, eastward of Bock Grund, and up to the narrows between West Clün (Klüne) and East Clün (Ost Klüne) is marked by buoys on both sides; farther northward, through the Usedom See, it is marked by pricken. It is 38 yards wide, with an average depth of 8 feet.

Pilots.—There is a pilot station at West Clün (Klüne), at the entrance to Usedom See. The pilots take vessels to Ückermünde, Anklam, Wolgast, and Swinemünde.

Usedom, a town on the southern coast of the island of that name, has about 1,800 inhabitants.

Elb und Bock Light Vessel exhibits a fixed white light 33 feet above the sea and visible 7 miles. The vessel is moored in 2½ fathoms about 1¼ miles eastward of the entrance to the Elb und Bock Dredged Channel, is painted red with Elb und Bock on both sides in white, and has one mast with a red ball on top. In winter the vessel's place is taken by a white spar buoy with a bush on it, marked "Elb und Bock."

Fog signal.—A bell is struck in thick or foggy weather. (See Light List.)

Coast.—Between the northern end of Usedom Island and the entrance to the Dievenow River, about 33 miles east-southeastward, the coast recedes southward, forming a bay 10 miles deep, named Pommersche Bucht, in the southern part of which is Swinemünde Road. The coast is wooded nearly everywhere, and is lower in the south than in the west and east.

From the north point of Usedom the coast trends in a southeasterly direction 22½ miles to the entrance of Swine River; the part of this coast between the northern end of Usedom and a hill named Streckelsberg, 10 miles southeastward of it, forms a low sandy bay with dunes, and, as far as Zinnowitz, is covered inland with forest.

The shoal water, under 3 fathoms, which extends about 3 miles eastward from the north point of Usedom, narrows to the southward and is foul in places only.

Eastward of Zinnowitz the coast is hilly; the shore reef is narrow, and at Streckelsberg, rocky. Southeastward of Streckelsberg the shore is wooded, the most elevated parts of which appear like islands from seaward; between the trees on this part of the coast several windmills, houses, and villas will be seen. From Ahlbeck, 9 miles southeastward of Streckelsberg, a plain covered with forest extends some distance inland, and through the middle of this plain flows Swiene River. The highest elevations on the coast are, Streckelsberg, 197 feet, wooded, and steep on the seaward side, about 12 miles northward of Swinemünde; Lange Berg, about 177 feet; Präsidentsberg, southward of Heringsdorf, about 164 feet; and Zirowberg, near Ahlbeck, about 193 feet.

Landmarks.—On the northeastern coast of Usedom are the following landmarks:

Streckelsberg Beacon, on the bare summit of Streckelsberg, is a black pyramid beacon surmounted by a horizontal barrel, with a

vane, the look-out tower eastward of Zinnowitz; the church of Zinnowitz, with its two towers above the surrounding woods, and visible a considerable distance; Bismarck Tower, 134 feet high above the ground, square, with a rounded top, and resembling a lighthouse at a distance, on Präsidentenberg; Ahlbeck Church, close to the beach, distinguishable by its high red gable.

Zinnowitz—Life-saving.—A lifeboat and rocket apparatus are stationed at Zinnowitz, a sea-bathing village about 4 miles westward of Streckelsberg.

The telegraph office at Zinnowitz is open until midnight, in summer only.

Heringsdorf is a watering place about 3 miles northwestward of Swinemünde. The pier has wing additions at the outer end, where there is a depth of about 16 feet, which is liable to decrease by sand deposit. A stone breakwater lies northward of the pierhead.

Lights.—There are 4 lights shown at Heringsdorf, 2 red and 2 green; they are private lights, and are shown only when the local steamer is expected, from June 15 to September 20. The red lights in line give the direction when, on account of the current, the steamer must lie on the east side of the pier, and the green lights in line when she must lie on the west side.

Fog signal.—A fog bell is rung as follows when the fog signals of vessels are heard. (See Light List.)

Ahlbeck, a fishing village and watering place, lies southeastward of Heringsdorf. Both places have railway connection with Swinemünde.

Storm signals are shown day and night from a mast standing westward of Streckelsberg Beacon; also by day from a mast on the beach at Ahlbeck.

Shoals—Buoys.—Between Zinnowitz Village and Streckelsberg the following dangerous banks lie from 1 to 2 miles from the shore:

Zinnowitz Bank, with $\frac{3}{4}$ fathom least water, is a rocky shoal situated $3\frac{1}{4}$ miles 327° from Streckelsberg Beacon and $1\frac{3}{4}$ miles from the shore. A white beacon buoy, marked "Zinnowitzbank N.," with top mark of two triangles, apex upwards, is moored about $\frac{1}{4}$ mile northward of the shoal.

Vineta Bank, with 3 feet least water, and general depths of 7 to 12 feet, extends $1\frac{1}{4}$ miles from the shore, $1\frac{3}{4}$ miles northwestward of Streckelsberg. A white spar buoy, marked "Vineta N.," surmounted by two triangles, apex upward, is moored off the northern end of Vineta Bank.

Koserow Bank, with $1\frac{3}{4}$ fathoms least water, lies about 1 mile north-northeastward of Streckelsberg; between this shoal and Vineta Bank there are depths of $3\frac{1}{2}$ to $4\frac{1}{4}$ fathoms. A white beacon buoy,

marked "Koserowbank O.," with top mark of two triangles, bases toward each other, lies off the eastern side of this shoal.

Koserow Steingrund, a rock about 600 yards long in an east and west direction, and 200 yards broad, with a depth of $3\frac{1}{4}$ fathoms over it and depths of 6 fathoms outside it, is situated 1.9 miles 9° from Streckelsberg Beacon. A white spar buoy, marked "Koserow Steingrund N.," and surmounted by two triangles, apex upwards, under an upturned broom, is moored northward of the rock, and a red buoy with a staff and flag is moored on the southwestern side of the $3\frac{1}{4}$ -fathom depth. Depths of $4\frac{1}{2}$ fathoms extend for $\frac{1}{2}$ mile northwestward of the buoys.

In winter spar buoys, with the top marks formed of brooms, are substituted for the above buoys.

Northward of the above banks are several patches with less than 5 fathoms on them; one, with $4\frac{1}{2}$ fathoms, lies 344° distant about 6 miles from Streckelsberg Beacon and about $4\frac{1}{2}$ miles offshore.

During the night, the coast near Streckelsberg should not be approached to a less depth than 8 or 9 fathoms.

Measured distance—Beacons.—In connection with the Vulkan Machine Works, three pairs of beacons are situated about 2, 3, and 4 miles, respectively, along the coast, in front of Pudagla Forest, to the southeastward of Streckelsberg, to indicate the course of two measured miles.

The front beacons have triangular and the rear beacons square top-marks.

Buoys.—In conjunction with the above beacons, three red oval beacon buoys, surmounted by a red ball (except the center buoy, which has a red and white striped ball), are moored parallel to and about 2 miles from the coast in a depth of 7 fathoms. They lie respectively with the western, center, and eastern pairs of beacons in line. At either end, in the line of the measured distance and about $\frac{3}{4}$ mile from the end buoys, is moored a red oval beacon buoy, with cone top mark, apex downward.

In addition to these buoys another line of buoys is established about 700 yards from the shore, in 23 feet of water, consisting of three red conical buoys with a white vertical stripe, one on each line of beacons numbered 2, 3, and 4 from southeast to northwest, and to mark the approach to this measured distance two red conical buoys, Nos. 1 and 5, are moored about $\frac{3}{4}$ mile from each end. These buoys will be taken up when ice appears, and laid out again when it disappears.

Port Swinemünde—Moles.—The entrance to the Swine, the central of the three mouths of the Oder River, and the lower part of which comprises the port of Swinemünde, is formed by two stone moles.

The eastern mole is 1,586 yards long, and extends from some sand hills in a curve in a north-northwest direction, convex to the eastward.

The western mole, which is considerably shorter than the eastern, extends in a slightly more northerly direction. It stands on a shoal, which forms the western side of the channel leading into Swine River.

The western side of the entrance channel is formed by a bank named *Westergrund*, which extends from a point about 1,600 yards north-northwestward from the outer end of the west mole, past it to the southward for about the same distance. The depth on the shoal outside the west molehead is from 1 to 3 fathoms, but inside it is considerably less, being dry in one steep-to part named *Joachim's Fläche*.

Navigable depths.—The depth on the leading mark, Mill and Galerie Beacons in line, and also between the moles is $29\frac{1}{2}$ feet, and the width of the channel 164 yards; as far as the dockyard the normal depth is 28 feet, gradually decreasing higher up.

The least depth in the channel between *Swinemünde* and *Stettin*, a distance of 37 miles, is 23 feet, plus or minus the difference between the actual and mean water levels.

The deepest vessel that has visited *Stettin* is a steamer drawing 24 feet that discharged there. The channel from sea to *Stettin*, through the *Kaiserfahrt Canal* and the *Great Haff*, can be navigated by vessels of 22 feet draft with the water at its ordinary level. A steamer drawing 22 feet 2 inches, also a mail steamer 526 feet in length, drawing 21 feet 9 inches, has visited *Stettin*. Dredging operations are in progress; it is proposed to deepen the channel to 24½ feet.

Water level.—Under ordinary weather conditions the water rises and falls to about 2 feet above and below the mean level. Heavy gales from the northeast may cause a rise of $3\frac{1}{2}$ feet above and southerly gales may cause a fall of like amount below mean water level.

Landmarks.—In approaching *Swinemünde* the following landmarks are conspicuous in addition to those previously mentioned: *Swinemünde Lighthouse*, tall, yellow, with red band; in thick weather the lighthouse is not always easily recognizable, but in that case the *Golm*, a saddle-shaped hill, 192 feet high, being the easternmost of the heights to the westward of *Swinemünde*, forms a good mark. Approaching the port from the northward it appears a little west of the lighthouse. The high, thick spire of the garrison church and the lower, slender spire of the *Evangelical Church*. Eastward of the entrance the shore is densely wooded, and the only conspicuous objects are *Lebbin Church*, which stands on a hill about $3\frac{1}{2}$ miles inland, and *Misdroi Church*, a red brick building with a spire.

Ice.—The channel is kept open from the sea to Stettin, for steamers, throughout the winter by ice breakers, three of which craft are constantly at work.

Current.—Between the moles and in the haven an outgoing current prevails during light winds from all directions. With strong winds between northwest and northeast the current sets inward with a velocity corresponding to the force of the wind, and often amounting to 4 knots. With strong easterly winds the current sets westward across the entrance, following the trend of the coast.

Beacons—**Signal Beacon.**—Near the middle of the eastern mole stands a white iron signal beacon with a red ball, having on it a movable staff with red flag.

In the event of a vessel being obliged to enter without a pilot during an on-shore gale, steering directions are given from the signal beacon by means of the movable staff with red flag, which is inclined to the side toward which the vessel should alter course; when the vessel is steering correctly the staff is placed upright as a signal to the vessel to steady, and remain on that course as long as the staff and flag remain so. When no pilots are at sea, and the red flag is not shown, the entrance is dangerous; under such circumstances it is advisable to remain at sea.

Land Beacon.—On a low sand hill near the shore, a short distance southeast of the east mole, there is a white beacon, with a red triangle, about 88 feet high. The Signal and Land Beacons in line bearing 147° lead between the east mole and the buoys marking the western side of the entrance channel.

Mill Beacon, on the western mole head, consists of a white circular tower, with four arms of a windmill.

Galerie Beacon, on the inner end of the west mole, is a white square structure of wooden beams, on which there is a white house, with black roof, and surrounded by a gallery; the Mill and Galerie Beacons in line bearing 170° lead into the entrance westward of the eastern mole end.

Light and bell buoy.—A red and black light and bell buoy, showing an occulting red light every 5 seconds—thus: Light, 4 seconds; eclipse, 1 second—is moored in Swinemünde Road, is $5\frac{1}{2}$ fathoms, with the Mill and Galerie Beacons in line, and distant 1.4 miles from the former beacon.

Buoys.—A red buoy, with a staff and two diamonds, lies in the entrance, 1,300 yards 337° from the east mole head, and close westward of the Mill and Galerie Beacon Leading Line. The western side of the entrance channel is buoyed as far as the haven with nine spar buoys with top marks: the outer buoy lies on the northeastern ex-

tremity of the Westergrund, and about 1,200 yards northwestward from the east mole head.

A white spar buoy marked "Ostmole W." with a top mark of a triangle over a horizontal drum, lies 150 yards outside the east mole head lighthouse, in a line with the mole, to mark the sunken débris from the building of the mole and also the turning point in the line of entrance.

Lights—Main lighthouse.—On the right bank of Swine River, 436 yards southward from the root of the eastern mole, stands a yellow circular tower with red band on square building, 223 feet high, from which, at an elevation of 212 feet above the sea, is exhibited an occulting white light, with a red sector showing up the Swine, visible 21 miles. (For details see Light List.)

E. Molehead.—A fixed red light, elevated 42 feet above the sea, and visible 10 miles, is exhibited on the eastern molehead from a red octagonal iron tower, 35 feet high. Unwatched.

Mill Beacon.—A group occulting white light, elevated 36 feet above the sea, and visible 10 miles, is exhibited from Mill Beacon, a white circular tower with four windmill sails, 34 feet high, situated at the western molehead. Should the light fail, a fixed light is shown. The light is unwatched. (For details see Light List.)

Galerie Beacon.—A group occulting white light, elevated 61 feet above the sea, and visible 12 miles, is exhibited from Galerie Beacon, a white, square wooden structure 67 feet in height, situated at the inner end of the Western mole, 560 yards from the Mill Beacon. (For details see Light List.) This light in line with Mill Beacon Light, bearing 170° , leads into the entrance.

A group occulting light with red and white sectors, simultaneously with the upper light, is shown at an elevation of 44 feet above the sea from Galerie Beacon. (For details, see Light List.) Unwatched.

The red sector is intended to mark the curve between the lines of the Signal-Land Beacon Lights and the Starckenhorst Leading Lights.

Signal Beacon.—A fixed light, visible 3 miles, is exhibited at an elevation of 31 feet above the sea, from the Signal Beacon on the east mole (white with a red ball, 70 feet high), showing red seaward and green within the port; this red light in line with the white light on the Land Beacon are leading lights for the entrance. Unwatched.

Wall Beacon.—A group occulting red light, elevated 31 feet, and visible 3 miles, is exhibited from the Wall Beacon, a white lattice mast, 33 feet in height, situated on the eastern mole about 100 yards, 164° from the signal Beacon. This light in line with the Land Beacon Light, bearing 145° , marks the western edge of the channel from buoy A. to buoy F. Unwatched. (For details see Light List.)

Land Beacon.—A fixed white light, elevated 98 feet above the sea and visible 5 miles, is shown from the Land Beacon (white, with red triangle, 88 feet high), which is situated 1,200 yards 147° from the Signal Beacon. Unwatched.

Starkenhorst Range Lights—Front.—An orange colored group occulting light is exhibited 31 feet above the sea from a white lattice mast, 33 feet in height, on the eastern side of Swine River near Starckenhorst, 680 yards 209° from the main lighthouse.

Rear.—A similar light to the front light, elevated 51 feet above the sea, is exhibited from a white lattice mast, 53 feet in height, situated 133 yards 191° from the front light.

These lights in line, bearing 191° , lead up the haven from the southern limit of the arc of visibility of Galerie Beacon Lower Light. The lights are unwatched. (For details see Light List.)

Pilot tower.—A group occulting light with white and red sectors is shown from the pilot tower on the west bank of the river about 650 yards south-southwestward of Galerie Beacon. (For details see Light List.)

Eichstaden.—On the northern end of the new quay on Eichstaden Island, on the western side of the channel, about $1\frac{1}{4}$ miles within the eastern molehead, an alternating white and green light is shown, at an elevation of 27 feet, and at the southern end of this quay, about 1,300 yards south-southwestward, there is an occulting green light, elevated 22 feet. The lights are shown from iron framework, the northern one green, and are unwatched. (See Light List.)

Westswine.—Two unwatched red range lights are shown from the Westswine Beacons to indicate the course into Alte Swine River.

A fixed white light (electric) is shown from the deviation dolphin in the Alte Swine as long as the river is not closed on account of ice.

Fog signals.—On the eastern molehead a fog trumpet, worked by compressed air, is sounded.

The pilot steamer stationed off the mouth of the river, near the bell-buoy, will, during thick or foggy weather, sound a powerful steam whistle in the manner laid down in article 15 of the "Rules for Preventing Collisions at Sea"; the whistle has a double sound, which counts as one sound in the sense of the above-named article 15, and consists of a deep note followed by a high note.

Swinemünde Road.—The southern part of Pommersche Bucht is named Swinemünde Road, and affords good anchorage in 5 to $5\frac{1}{2}$ fathoms, clay, from $1\frac{1}{2}$ to 2 miles distance northward of the entrance to the Swine. The depth of 6 fathoms is found about $3\frac{1}{2}$ miles northward of the east molehead. A plantation prevents the town of Swinemünde being seen from the road, but König Wilhelmsbad Buildings and villa situated on the western side of the river mouth can be seen from a considerable distance.

The Mill and Galerie Beacons in line bearing 170° may be used for swinging ship.

Artillery practice takes place from time to time at Swinemünde seaward from the coast forts by day and night.

During the hours of practice vessels are prohibited from entering or leaving the harbor. When the harbor is closed on this or other grounds, a green flag will be hoisted at the lighthouse.

Pilots.—There are four chief pilots, 37 sea, and 24 river pilots. Pilotage is compulsory for merchant vessels; only in cases of extreme necessity, when vessel and crew are in danger, may entry be made without a pilot. There are two pilot steamers and a steam launch, in which the pilots meet vessels; in exceptional cases they use a sailing boat as far as the road. If a pilot is unable to board an approaching vessel on account of bad weather, the pilot steamer hoists red flag and steers ahead of the incoming vessel, which follows in the steamer's wake; the pilot will board between the east molehead and the Signal Beacon.

Vessels arriving off Swinemünde at night and making the night signal are furnished with pilots and brought into the haven.

Sea pilots take vessels from Swinemünde to sea and the contrary; river pilots take them from Swinemünde to Stettin and back.

Vessels sighted are reported by telephone from the lookout at the inner end of the west mole to the pilot station in the town.

Hafen.—Swinemünde Hafen, at the mouth of the Swine River, extends from the east molehead to the south point of Eichstaden, a distance of 2.6 miles, with a width of 164 to 328 yards, and depths of from 26 to 33 feet; it has over 6 miles of sea-wall, near which the depth varies between 23 and $32\frac{3}{4}$ feet on the east bank and 23 to $26\frac{1}{4}$ feet on the west bank, but owing to the varying water level and the deposit of sand these depths can not be depended on with certainty; information concerning the actual depths may be obtained at the Hafenbauamt. Railways run along the quays.

The Winter Hafen is a channel formed by Grüne Fläche Island and the west bank of the Swine; it is 100 yards wide, with depths up to 16 feet. Opposite Grüne Fläche is Eichstaden, with the Kohlenhafen between, in which are mooring buoys for the colliers. On the east side of Grüne Fläche are large coal stores. There are two jetties at Starkenhorst, on the eastern side of the haven, just to the north-eastward of the dockyard, with 28 feet of water alongside.

Important Notices to Mariners are shown at the harbor office.

Mooring buoys lie on the eastern side of the haven, opposite the north point of the Hafen Railway Station and opposite the building yard, in depths of $4\frac{3}{4}$ to $5\frac{1}{2}$ fathoms, and opposite Eichstaden in depths of $3\frac{3}{4}$ to $4\frac{1}{4}$ fathoms.

Directions.—Approaching Swinemünde from the northwestward with westerly winds, as soon as the lighthouse is seen it should be brought to bear 160° and steered for in that direction. With easterly winds it should be brought to bear 170° . During the night care is necessary when approaching the coast near Streckelsberg to avoid the Vineta and Koserow Banks. Swinemünde Light, bearing 148° will lead 2 miles eastward of these dangers, and bearing 176° will lead clear westward of the western side of Oder Bank, which is steep-to.

Southeastward of Streckelsberg there are no outlying dangers, and a vessel of moderate draft may approach the shore to within 1 mile, except in the neighborhood of the entrance to Swinemünde; a depth of $4\frac{1}{2}$ fathoms lies 2.1 miles from the shore and 4 miles northwestward of Swinemünde Entrance; it is, however, advisable to keep more to the eastward, as the current from the Swine River Entrance with southerly winds generally runs to the westward. In gales from west-northwestward through west to south this part of the coast affords well-sheltered anchorage. Approaching from the eastward, when Gross Horst Lighthouse bears 127° , distant about 10 miles, steer 237° until Swinemünde Lighthouse bears 170° ; a vessel will then be in the roadstead about 3 miles from the eastern molehead. Depths of $4\frac{1}{2}$ fathoms are found $4\frac{1}{2}$ to 5 miles from the shore off the Dievenow River, 14 miles northeastward of the entrance to Swinemünde.

Approaching the Swine, the lighthouse of Swinemünde is first seen in clear weather, and on a nearer approach the municipal Kurhaus and villas near and the church towers of Swinemünde.

To enter, with Mill and Galerie Beacons in line, bearing 170° , steer into the entrance until abreast of the white spar buoy off the east molehead, when the Signal and Land Beacons in line lead along the east mole at from 80 to 90 yards distance, until abreast Mill Beacon, when the east bank of the river should be followed at the same distance as far as the hafen.

In northerly gales, which prevent taking a pilot on board, the pilot steamer must be followed; a boat with a pilot will be waiting by the east mole, and speed must be reduced to take him on board.

Should a vessel be obliged to enter without a pilot during an on-shore gale, the course to be steered is indicated by a red flag on a staff at the Signal Beacon. If a large green flag is hoisted on the high lighthouse the vessel should not attempt to enter, but remain at sea.

At night the directions for entering by day are followed, as the beacons are lighted.

Anchorage.—The channel affords excellent shelter for small vessels, but with strong northerly winds there is a nasty sea over

the bar. Anchorage may be found on the eastern side of the Swine as far as Movenhaken. The berth assigned by the pilot must not be shifted without permission from the pilot office.

Steamers drawing more than 16 feet must not work their screw propellers when going alongside the sea wall between the Swinemünde-Ostswine Ferry and the north end of the Hafen Railway Station, or for trying engines. Such vessels going alongside must anchor about 55 yards from the wall and haul in with hawsers or with the help of a tug. On leaving, the vessel must heave in on the anchor chain, assisted by a tug if necessary, and not try the engines until lying at the anchor.

The fishing haven near Osternothafen, a fishing village on the east bank near the main lighthouse, has a depth of 9½ feet.

Vessels arriving at Swinemünde will be inspected and cleared by the police sanitary authorities at any time during the night, but vessels requiring to be so cleared must be reported (by telegraph or otherwise) before 9:30 p. m. at the office of the Schiffahrtsamt at Swinemünde. Similar arrangements with respect to the customs clearance have been made. These facilities will enable vessels proceeding to Stettin to save several hours. In the case of vessels not going alongside the quay, owners or agents are to convey pilots, customs, and sanitary officers to or from the vessel.

Since January 1, 1914, steamers entering the port of Swinemünde bound for Stettin need not be reported at the customhouse. Under new regulations, the compulsory pilots have been sworn, and perform the duties formerly executed by the customs officers, so that the vessel is allowed to proceed to Stettin without a customs officer.

Explosives.—A special berth is assigned by the harbor master to vessels laden with explosives.

Vessels laden with petroleum secure to the mooring buoys near the ferryhouse on the east bank with hawsers, net chains; at night they must carry a red light, visible all round, 3 feet above the anchor light.

Water gauge.—A water gauge is at the entrance to the building yard; the mark for reading the decimeters is two arrowheads, which are lighted at night by incandescent lamps. It gives the height of the water above zero of the gauge and at mean level shows 1.01 meters (3¼ feet). It can be read from the stream.

Telegraph beacons.—The position of the telegraph cable across the river, southward of the Swinemünde-Ostswine Ferry, is marked by a green board marked "Telegraph," fixed to the sea wall on each bank, and the direction is given by two green beacons on the east bank; the front beacon is triangular, on the board above mentioned, and the rear beacon is square on a high pole and marked "T."

Vessels are forbidden to anchor within 55 yards of the line of beacons, above or below.

Tugs are always available. Vessels in the road requiring a tug hoist two flags one above the other, at the fore, when one will be sent out: or a signal can be made by International Code, which is received and answered at the pilot watchtower on the west bank; the signal mast is on the tower.

Life-saving.—Four lifeboats and two rocket apparatus are stationed at Swinemünde. On the west side of the river boats are stationed at the pilots' haven and at Galerie Beacon, and boat and rocket apparatus at the Strand Promenade, westward of Galerie Beacon: on the east side a boat and rocket apparatus are stationed southeastward of the Land Beacon.

Quarantine.—A quarantine establishment is situated on the east side of the river, southward of Osternothafen.

Time signal.—On the left bank of Swine River, 120 yards eastward of the new Navigation House, from a height of 125 feet above the water and 115 feet above the ground, a black ball, 5 feet in diameter, is dropped at 23 h. and 0 h., Greenwich Mean Time, equivalent to noon and 1 h. of the meridian of longitude 15° E. (Standard Mean Time). At 10 minutes before the signal the ball is hoisted halfway up, and at 3 minutes before the signal close up to its full height. The drop is 10 feet.

When the signal fails in accuracy a red ball, 1 foot 4 inches in diameter, will be hoisted within 3 minutes halfway up one of the stays of the structure, and be kept there for 5 minutes, and the error in the signal made known.

Should the signal fail, the red ball will be hoisted within 3 minutes and kept up till the time ball is lowered.

When the apparatus is out of order the red ball will be shown until the error is corrected.

Harbor regulations.—A summary is published, in pamphlet form, of the special police regulations to be observed by vessels navigating the inland seas and rivers and using the harbors, etc., between Swinemünde and Stettin: a copy of these regulations should be obtained and closely adhered to.

Vessels arriving at Swinemünde are subject to a preliminary examination, before which no communication is to be allowed with the shore. When permission to communicate has been given the vessel is to be reported, with the required details, at the navigation police or pilot office, and a berth will be assigned. If a shift of berth is desired permission must be obtained from the pilot office, and a pilot employed.

Mooring chains and ropes may only be secured to the buoys and dolphins provided, and fenders must be supplied to prevent damage to the quays.

No rubbish of any sort may be discharged overboard, and special permission must be obtained to discharge ballast.

Vessels lying in the loading or discharging berths must top their yards and run in the jib boom.

The national flag must be hoisted on holidays and prescribed festivals at the request of the police authorities. The following church holidays, on which no work is allowed, must be observed, viz: Sunday, Christmas (two holidays), New Year, Good Friday, Easter (two holidays), ascension day, Whitsuntide (two holidays), and the Wednesday before the last Sunday in Trinity.

Special regulations are in force as to fires allowed on board during the winter season, and the use of fire and lights may be entirely suspended.

Vessels clearing from Stettin and not wishing to stop at Swinemünde can comply with the Swinemünde regulations at Stettin, and thus avoid delay.

The river pilot and customs officer must be landed in the river Swine, in the harbor, and the landing and embarking of pilots and customs officers is at the expense of the vessel.

A customs signal, consisting of a flag 5 feet long by 3 feet broad, black and white diagonal, by day, and a white light over a green, by night, must be shown from the aftermast, or gaff, or ensign staff from the time of leaving the Kaiserfahrt till the piers are passed.

Storm signals are shown at Swinemünde from a signal mast on the east side of the harbor near the Swinemünde-Ostswine Ferry. Weather reports can be seen at the Schiffartsamt.

Deviation.—A dolphin for the adjustment of compasses has been erected in the northern entrance to the Alte Swine, in about 2½ fathoms of water.

From the dolphin, Bismarck Tower bears 315° 50', distant about 4½ miles, and Swinemünde Main Lighthouse 33°.

Swinemünde, a town and watering place with 14,198 inhabitants in 1911, lies on the left bank of the Swine River, about 1½ miles from its mouth, and is the outer port of Stettin. It has no industries of any importance, but is engaged in shipping, in the building of small craft, and the breaking up of ships. The Schiffahrtsamt is in the neighborhood of the time ball. There is a garrison hospital.

Communication.—Swinemünde is in railway communication with Stralsund, Stettin, and the German system, through Usedom Island; also with Misdroy, Wollin, and Stettin, through Wollin Island, which is reached by railway ferry from Swinemünde; also with Wolgast via Heringsdorf. There is also regular communication

by steamer with Stettin and places on the inner channels. There is telegraphic communication, and the office is always open.

Radio station.—A radio station is located at the post office, Swinemünde, open for public traffic with ships at sea, between 6 h. a. m. and midnight. Call letters K. A. W.

Patent slips.—See Appendix I.

Floating dock.—See Appendix I.

Repairs.—Small repairs to the hull, boilers, and engines of vessels can be executed at the building yard of the Königlich Hafenbauamt. There is an iron foundry and shipbuilding establishment on Grüne Fläche. The Hafenbauamt has a skilled diver; lighters for salvage purposes, pumps, etc., are also available.

Cranes.—At the Bauhof there are a 30-ton sheers and a 5-ton crane, and a similar crane is on the west bank of the Winter Hafen.

Coal is obtained from lighters; there is no special coal wharf. About 114,000 tons of coal are imported annually, and about 6,000 tons are in stock; some is stored on Grüne Fläche, and some on the east bank where vessels can load; the depth alongside is from 18 to 26 feet. About 1,000 tons of patent fuel are stocked.

Supplies.—Provisions and marine stores can be obtained at Swinemünde. Good water is obtained from tank boats, or by hose from the shore.

Trade.—The principal imports are coal, coke, chalk, paving stones, petroleum, iron, and piece goods. The exports are principally wood, raw sugar, cement, coal, and coke.

Swinemünde to Stettin.—The distance from Swinemünde to Stettin, through the Swine, Great (Groszes) Haff, and Oder, is about 40 miles; but through the Kaiserfahrt Canal, across the south-east part of Usedom, the distance is shortened 5 miles. The Mellinfahrt, a cutting through the Mellin Peninsula, between Movenhaken and the Kaiserfahrt, is now the main channel for steamers and vessels in tow. Vessels under sail may not pass through the Mellinfahrt, but must use the channel of the Alte Swine, eastward of Mellin Island. The Kaiserfahrt Canal is $3\frac{1}{2}$ miles long, the dredged channel across the Great Haff $10\frac{1}{2}$ miles and about 164 yards wide, and that from the entrance to the Papenwasser to Stettin $17\frac{1}{2}$ miles. In the northwestern part of the Great Haff the water is occasionally brackish; in the Papenwasser, however, it is always fresh.

Pilots for Stettin can be obtained at Swinemünde. Pilotage between Swinemünde and Stettin is compulsory, but it must be borne in mind that, although indispensable, pilots, in the meaning of the law, are only guides for the purpose of giving information and assistance to the master. Masters will therefore do well not to leave the command to these pilots, as in the event of accident they, and not the pilots, will be liable for damages.

Ice.—The Swine, the Haff, and the Oder freeze much earlier than Swinemünde Road, but are kept open by ice breakers as long as the western and middle parts of the Baltic are not closed by ice. Four powerful ice breakers are kept at Stettin.

Lights.—Only the main channel to Stettin and the Alte Swine are lighted. The system of leading lights is adopted as far as possible on account of the narrowness of the channel. Light buoys are placed at important turning points, but can not be depended on when ice is in motion.

The following lights are used in the navigation of the main channel as far as the Königsfahrt, about 6 miles below Stettin; the lights are briefly described in the order in which they are used, and for details the Light List should be referred to.

Mellinfahrt.—An alternating group flashing light, elevated 35 feet, is shown from a red wooden beacon, 37 feet high, situated on the northern end of Gross Mellin Island, on the eastern side of the entrance to the Mellinfahrt. (For details see Light List.)

An occulting white light, elevated 30 feet, is shown from a white wooden beacon, 31 feet high, with red triangular topmark, situated on Gross Mellin Island, about 1,600 yards southeastward of the above light.

A fixed white light, elevated 53 feet, is shown from a white wooden beacon, 56 feet high, with red diamond topmark, situated in the middle of Gross Mellin Island. This light in line with the preceding occulting white light leads through the lower reach of the Mellinfahrt above the light buoy. (See Light List.)

An occulting white light, elevated 30 feet, is shown from a white wooden beacon, 31 feet high, with red triangular topmark, situated on the western side of Gross Mellin Island, southward of the preceding fixed white light, and in line with it leads through the upper reach of the Mellinfahrt to the Kaiserfahrt Canal.

An occulting red light, elevated 18 feet, is shown from a red iron beacon, 25 feet high, situated on the southern end of Grüneholm, the southern part of Gross Mellin. (See Light List.)

Kaiserfahrt.—An alternating group flashing light, elevated 18 feet, is shown from a red beacon, 18 feet high, on the north point of Klein Mellin, on the eastern side of the northern entrance to the Kaiserfahrt.

Range Lights.—Two white electric lights are shown from the Caseburg (Kaseburg) Beacons on the western side of the northern entrance to the Kaiserfahrt Canal. The rear light, fixed white, elevated 150 feet, is shown from a wooden frame with iron post above, 145 feet high; the front light, elevated 57 feet, is occulting white and is shown from a white wooden beacon in the form of an isosceles triangle, 85 feet high, with horizontal battens, situated 820 yards

142° from the rear light. In line they lead through the Kaiserfahrt and the Haffrinne. (See Light List.)

Fixed white lights, elevated 72 feet, are shown from white beacons with pole and red circular topmark, 77 feet high, situated on the eastern and western moleheads at the southern entrance to the Kaiserfahrt. A fixed red light below the western light shows on each side.

Haffrinne Range Lights.—The rear light, fixed white electric, elevated 125 feet, is shown from Papen Beacon, a square wooden tower, upper part black, lower white; the front light, occulting white, elevated 49 feet, is shown from Keppenort Beacon, a black square wooden tower. The lights are about 1 mile apart and in line bearing 142° lead through the Haffrinne. Small subsidiary white lights are shown from both beacons for the use of small craft, and a fixed red light is shown from Papen Beacon to mark the curve in the dredged channel between red buoys "C" and "D."

Dredged Channel—Beacon lights.—Two pairs of beacon lights have been established in the Haffrinne Dredged Channel, the first pair one on each side of the channel just to the southeastward of buoys Nos. 7 and G, respectively, and the second pair one on each side of the channel just northwestward of buoys Nos. 14 and O, respectively.

Leitholm.—A group occulting light with white, red, and green sectors, elevated 42 feet, is shown at the north molehead on the north-western end of Leitholm, and a group flashing light, with white, red, and green sectors, elevated 26 feet, is shown at the south molehead on the southeastern end of the island. The lights are shown from iron framework beacons; the northern has lower half white and the rest black; the southern is white with black lantern and gallery. (For details see Light List.)

Fog signals.—In thick or foggy weather a bell is sounded from the northwest beacon and from the southeast beacon. (See Light List.)

Sandhof.—A fixed white light, elevated 82 feet, is shown from Sandhof Beacon, a white wooden framework with black upper part, 88 feet high, situated on the northern side of Stepenitz Bucht. A fixed red light from the same beacon marks the curve in the channel between the red buoys "F" and "G."

Siebort.—An occulting white light, elevated 38 feet, is shown from Siebort Beacon, a triangular wooden pyramid, 41 feet high, the upper part painted black and the lower white, on Stek Point. This light in line with Sandhof Beacon Light, bearing 111°, leads through the channel southeastward of Leitholm. (For details see Light List.)

Büchenort.—A fixed white light, elevated 82 feet, is shown from Büchenort Beacon, a wooden framework, black above and white

below, on masonry, 98 feet high, situated in the southern part of Stepenitz Bucht.

A fixed red light, from the same beacon, marks the curve in the dredged channel between the red buoys "H" and "J."

Stepenitz.—A group occulting white electric light, elevated 38 feet, is shown from Stepenitz Beacon, a square wooden framework, upper part black, lower part white, 41 feet high, situated in the middle of the entrance to Stepenitz Bucht. It serves as front light for two range lines. In line with the Büchenort Beacon Light, bearing 133° , it leads toward Stepenitz Bucht. (For details see Light List.)

Ganserin.—A fixed white electric light, elevated 82 feet, is shown from Ganserin Beacon, a white, wooden framework with black upper part, 83 feet in height, on the shore eastward of Leitholm. In line with Siebort Beacon Light, bearing 338° , it leads through Stepenitz Curve, between red buoys "G" and "H."

The fixed white light on Sandhof Beacon and the group occulting white light on Stepenitz Beacon, in line astern bearing 3° , lead from the southern end of Stepenitz Curve through the channel southward.

Schwabach.—A fixed white light, elevated 82 feet, on Schwabach Rear Beacon, a wooden framework with gallery, black above and white below, 85 feet in height, and an occulting white light, elevated 38 feet, on the front beacon (Schawankenheim), similar to the rear and 41 feet high, in line bearing 168° , lead through the channel in the south part of the Papenwasser from buoys "M" and "12" to the entrance of the Weite Strewe.

Schanzen.—A fixed white light, elevated 49 feet, is shown from the southern, and an occulting white light, elevated 26 feet, from the northern Schwanzen beacon, situated on Politz Marsh; the beacons are formed of wooden framework with gallery, black above and white below, and are 54 and 31 feet high, respectively. The lights in line, bearing 171° , lead through the southern part of the Weite Strewe, eastward of Narrow Island (Schmal Werder). A green side light is shown from the southern beacon to mark the curve in the channel between the Weite Strewe and the Damanscher Strom.

Politz.—A fixed light with white and green sectors elevated 49 feet, is shown from the northern, and an occulting light with white and green sectors, elevated 26 feet, from the southern Politz Beacon, both formed of wooden framework with gallery, black above and white below, 54 and 31 feet high, respectively, situated on the southern part of Kolpin (Kölpin) Werder. In line about 309° they lead through the channel in the Damanscher Strom (Mittelloch) as far as buoys "R" and "17."

Cameelsberg (Camelsberg).—A fixed white light, elevated 49 feet, is shown from the southern, and an occulting white light, elevated 26 feet, from the northern Cameelsberg Beacon, on the right bank of the Oder. The southern or rear beacon is a white framework with black diamond topmark 55 feet high; the northern beacon is a triangular wooden pyramid 31 feet high, black above and white below. The lights in line bearing 153° lead through the channel in the Damanscher Strom (Mittelloch), eastward of Monk Island (Monck Werder), as far as the Ihna Light Buoy.

Königsfahrt.—An occulting light with white, red, and green sectors, elevated 51 feet, is shown from the Königs Beacon, a black, wooden framework, 55 feet in height, situated on the eastern side of the northern entrance to the Königsfahrt, which is a cutting at the southern end of Little Oder Marsh. (For details see Light List.)

A fixed white light, elevated 49 feet, is shown from Ihna Beacon, a white, wooden framework, 54 feet in height, situated on the southern bank of the Ihna River, near its mouth, and in line with Cameelsberg (Camelsberg) North Beacon Light, bearing 23° , leads through the channel above Königs Beacon.

There are three other pairs of leading lights and a cross-mark light on the Oder between Königs Beacon and Stettin. (See Light List.)

All the above lights are unwatched except those on Læitholm.

Beacons.—Besides the light beacons described above, which serve for the navigation of the channels by day, are the following:

Stern Beacon, on Morenhaken Spitze, on the eastern bank of the Swine, is red, with star-shaped topmark, and indicates the bank when overflowed at high-water level.

The two Kliiss Beacons, on the east side of the river southwestward of Morenhaken, in line lead toward the Kaiserfahrt until abreast of Lognitzer Ort, and the southern beacon in line with the laundry at Langeweise leads through the channel in prolongation of the line of Westswine Leading Beacons until southeastward of Kliiss. The northern beacon is white, with square topmark; the southern is red and white, with triangular topmark, point upward.

Ostball Beacon, black and red, on the eastern side of the Kaiserfahrt Canal, marks the northern entrance between the moles built out into the Great (Groszes) Haif.

Measured distance beacons.—On the eastern shore of the Papenwasser, in the neighborhood of Ganserin and Siebort Beacons, two pairs of beacons have been erected to mark a measured mile: when in line these pairs of beacons point respectively to buoys "D" and "4" and "F" and "6." The front beacons are 23 feet high, with triangular topmarks; the rear beacons are 33 feet high, with square topmarks. All the four beacons are white.

Telegraph beacons, with a board marked "Telegraph," indicate the cables across the Kaiserfahrt at Caseburg (Kaseburg) Ferry and across the Damianscher Strom at Politz Marsh and opposite.

Electric-light cables, across the Mellinfahrt, are marked by a green board on each bank, marked "Kabel," about 150 yards northward of the south point of Gross Mellin Island; they also cross the channel at right angles at the south end of Leitholm and at Stepenitz Beacon, where boards with painted anchors are fixed.

Buoys.—The Swine, Alte Swine, Hafrinne, and the channels through the Papenwasser and Mittelloch are well buoyed; red spar buoys to starboard and black conical buoys to port, entering; light-buoys are placed at important turning points, but they can not be depended on when ice is in motion.

Light buoys.—A red buoy, "B," with an occulting green light every 4 seconds, opposite the southeastern end of Leitholm; two red buoys, "G" and "H," with occulting green lights, every 4 seconds on the western side of Stepenitz Curve; and a black buoy marked "Ilna 20," with a fixed white light, moored in 4 fathoms in the Mittelloch, on the edge of the channel near the mouth of the Ilna River.

Regulations.—Entrance to the Kaiserfahrt from the Swine or the Mellinfahrt is prohibited when a ball is hoisted at the signal mast on the eastern side of the Caseburg (Kaseburg) Ferry.

Sailing vessels must use the Kaiserfahrt with a fair wind only; as previously mentioned, sailing vessels must not use the Mellinfahrt.

Dredgers, places where work in the water is in progress, piers, wharves, rafts, timber ponds, and deeply laden open craft must be passed at a modern speed. Dredgers and places where work is in progress must be passed on the side marked by a red ball.

The railway ferry between Swinemünde and Ostswine, at the entrance to the Mellinfahrt, the Caseburg Ferry in the Kaiserfahrt, and that between Langenberg and Politzer Schanze, must be passed at a moderate speed. With the railway ferry boats the rule of the road is followed, but in the case of the others, including that in Swinemünde Hafen, vessels pass under the ferry boats' stern. Red lights are shown at the starting places of the Swinemünde Ferry and at the bow and stern of the ferry boats, and white lights at the same places at the Caseburg Ferry.

An anchor must be ready to let go, and if it is necessary to drop it, room must be left for other vessels to pass.

Anchorage is prohibited in the deepened channel, and outside it on the line of leading beacons, westward of this channel between the Königsfahrt and the south end of the Kaiserfahrt; between the

south end of the Engen Strewe and the north end of the Fetzling, as well as in vicinity of the cables.

Vessels of $16\frac{1}{2}$ feet draft and over, when using the channel through the Haff and requiring the deepest water, have two black balls 2 feet in diameter and $6\frac{1}{2}$ feet apart vertically in the port fore shrouds at least $19\frac{1}{2}$ feet above the deck: at night two red lights in globe lanterns similarly placed. Other vessels meeting those showing the above signal must give way, and if necessary leave the channel.

Sailing vessels of more than $9\frac{3}{4}$ feet draft must only use the channel with a fair wind, and sailing vessels crossing it must do so at about right angles and give way to vessels using the channel.

Sailing vessels and tugs of less than $9\frac{3}{4}$ feet draft must not use the deepened channel.

In the channel between the Königs Beacon and buoys "14" and "O," near Gnageland, steamers must not exceed a speed of 10 knots an hour.

Swinemunde and Stettin—General regulations for harbors and waters.—Steam whistles, etc., and foghorns may only be used in the district during fog, thick weather, and falling snow, and for making necessary navigational signals. Also for the opening of bridges, the signal for which is a long blast followed by the ringing of the bell.

Vessels overtaking may pass the vessel ahead, provided there is sufficient room, and the leading vessel, if signaled to, must give way as far as possible. If within the fairway (Swinemunde to Stettin from the Königsfahrt down to the southern end), the signal for wishing to pass is 4 short blasts, to be answered by the other steamers, who will then give way and reduce speed.

Vessels are not allowed to overtake others within 300 yards of ferries, dredgers, bridges, mooring berths, or where work is being undertaken.

On the Oder above Stettin, between the new Oder Bridge and Jungfernberg, steamers going in the same direction at the regulation speed may not approach within 300 yards.

Speed must be reduced when passing dredgers either at anchor or in tow, all dredging craft, places where work is being carried out in the channel, shipbuilding yards, bridges, and ferries, or ships loading or discharging, deeply loaded craft, and timber rafts. Also the same rule applies to all riverside buildings when they show by day a red cylinder and by night a red light between two white lights.

When steam dredgers, diving bells, etc., require ships to stop they show a diamond by day and a red light above a green by night.

The speeds in the Kaiserfahrt and other canals are governed by time over certain distances, and should be carefully attended to.

In case of collision or distress, all vessels near must assist those in trouble.

Anchorage is prohibited near or under the bridges in Stettin Harbor or on the left side of the Oder above and below the place where the water is taken for the municipal waterworks.

Vessels unable to proceed out of the Mellinfahrt or Kaiserfahrt must moor in the special place assigned, and a space of at least 200 meters is to be allowed from any vessel loaded with explosives.

All vessels must give way to the royal yachts and vessels carrying the royal ensign, and must not approach such vessels within 200 yards or stop in their vicinity when at anchor.

Directions.—From Swinemünde, steer through the Mellinfahrt guided by the buoys and the light beacons on Gross Mellin Island, into the Kaiserfahrt. The Caseburg (Kaseburg) Light Beacons in line astern, bearing 322° , lead through the Kaiserfahrt and the channel through the Great (Groszes) Haff, which is buoyed on both sides. When Keppenort and Papen Beacons are seen steer for them in line, bearing 142° till the southern light beacon on Leitholm is seen to the right of the northern light beacon on that island, when the course is parallel to Leitholm, about 100 yards from it, and then between the buoys which mark the channel as far as the mouth of the Crampe (Krampe) River.

The pairs of leading light beacons in the following order, the rear beacon being the first mentioned, Sandhof-Siebort, Bücherort-Stepenitz, Ganzerin-Sielort, Sandhof-Stepenitz, and Schwabach-Schwankenheim, also lead through the channel.

Farther on the channel is followed by means of the Schanzen (on Politz Marsh), Politz (on Kolpin (Kölpin) Werder), and Cameelsberg (Camelsberg), Light Beacons. That part of the channel named Mittelloch, abreast Politz Marsh, is buoyed as far as the mouth of the Ihna River, where a black light buoy marks a curve in the channel. Then steer for the Königs Beacon, at the entrance to the Königsfahrt, passing northwestward of it, and thence to Stettin, keeping about midway between the banks of the Oder.

At night.—Having passed the light on the southern end of Eichsteden, steer into the Mellinfahrt, passing westward of the light on the northern end of Gross Mellin Island, and bring the northern pair of range lights on that island in line: the middle of the flat curve is then followed, steering along Mellin until the southern pair of range lights on the island come in line astern, which leads into the Kaiserfahrt, passing westward of the lights on the south point of Gross Mellin and on the northern point of Klein Mellin. Hence to Leitholm the directions for day should be followed with the help of the lights in the beacons mentioned, passing northward of the light buoy off the southeastern end of that island.

After passing Leitholm, bring Sandhof and Siebort Lights in line and continue until the red light of Papen Beacon is seen, which shows over the curve between buoys "C" and "D," when turn gradually about a point to starboard until Bücherort and Stepenitz Lights are in line. Follow the last line until the red sector of Sandhof Light is seen, which shows over the curve in the dredged channel between red buoys "F" and "G," when turn gradually to starboard, keeping the range lights a little open, until Ganserin and Siebort Lights are in line astern, which lead eastward of two light buoys with occulting green lights, to between buoys "H" and "S," where the red sector of Bücherort Light marks the curve of the channel into the line of Sandhof-Stepenitz Lights. The latter line, astern, is followed until the Schwabach-Schwankenheim Lights come into line ahead, when they are steered for until the white light on the two Politz Beacons on Kolpin (Kölpin) Werder come in sight.

When about abreast of the eastern beacon on Basket Island (Gross Korfwerder), turn to starboard and head midway between the two Politz Lights before they show green, until the Schanzen Range Lights on Politz Marsh are in line ahead; these are steered for until the Politz Beacon Lights on Kolpin (Kölpin) Werder come in line, which must be kept astern until the Cameelsberg (Camelsberg) Lights are in line ahead, and steer for them. When the green light on Königs Beacon changes to white, steer for it, and leave it on the port hand. Cameelsberg north light and Ihna Beacon Light in line lead through the Königsfahrt, above which the channel as far as Kratzwieck is marked by two pairs of range lights, after which the right side of the channel is kept. A pair of red range lights are on the east bank of the river abreast Frauendorf. A pilot should be employed.

Stettin Hafen.—The total length of the sea walls and banks of the hafen amounts to about 20 miles, of which about 12 miles are sea wall. About $5\frac{1}{2}$ miles of sea wall are public; in front of upward of $2\frac{3}{4}$ miles of wall, situated on the Oder below the Baum Bridge, in the Dunzig, between the Oder and the free district, and in the free district, the depth is 23 feet; of the remainder of the public sea wall about $2\frac{1}{4}$ miles has $19\frac{1}{2}$ feet, and about 730 yards, $9\frac{3}{4}$ feet in front of it. Quays are constructed along about half the length of the public sea wall.

Close below the Baum Bridge the Dunzig River branches off from the Oder, and the Parnitz River branches off immediately above the town, both streams discharging into the Dammsche See. The Oder-Dunzig Canal connects the Oder just above Grabow, with the Dunzig and the Freihafen. The Dunzig-Parnitz Canal connects the Dunzig with the Parnitz eastward of the Freihafen, and the Grüne Graben connects the Oder with the Parnitz below the railway bridge.

Harbor regulations.—In addition to the regulations previously quoted for Swinemunde, the following apply to Stettin:

On arrival the vessel is to be reported at the harbor office, and within that part of the harbor which extends from Bleichholm to the new railway bridge no sails may be carried, the yards must be topped, and all booms rigged in, and anchors stowed.

Police instructions will be given as to fires and lights.

Ballast can only be worked, at places especially provided, under the direction of the port authorities.

Special care is to be taken to report the arrival or departure of all persons who come with the vessel or go away with her.

The Freihafen, opened in 1898, lies on the east bank of the Oder, between the Dunzig and the Parnitz. It has an area of about 55½ acres. The entrance is by the Oder-Dunzig Canal, which has a depth of 23 feet, and a bottom width of 259 feet; the entrance into the hafen basin is 328 feet wide, and has the same depth as both the hafen canals, viz. 23 feet.

The turning place for vessels in the hafen basin has a diameter of 623 feet at a distance of 65 feet from the quay walls. The hafen basin and the eastern and western hafen canals are bordered with quays of a total length of 1.8 miles, on which double lines of railway are laid; the length of quayage in the east hafen canal is 6,621 feet, in the western hafen canal 4,065 feet. Behind, at present, are six large sheds, two of them with cellars and one for merchandise, with lifts and winches to raise 1½ tons. The administrative building, in which are the offices of the hafen manager and traffic inspector, is situated at the southern end of the Freihafen.

The quays are lighted by electricity.

Cranes.—For discharging and loading work at the quays and sheds, there are 75 hydraulic cranes to lift from 1½ to 5 tons; one crane of 10 tons, one traveling crane of 6 tons, and eight fixed cranes of 1 ton are electric. The 69 cranes on the quay side project from 28 to 39 feet; eight of them are adjustable to between 28 and 34 feet.

The municipal quays on the Dunzig are equipped with 18 steam traveling cranes lifting from 1½ to 5 tons. A 3-ton hand crane is on the left bank of the Oder by the railway bridge and another on the Parnitz. Above the bridges are two private hand cranes, one floating and one fixed, for masting river craft.

In the Freihafen lies a floating steam sheers to lift 40 tons.

Bridges.—There are three lift bridges across the Oder, with openings 57 feet wide, the lowest downstream being the Baum Bridge; also a railway swing bridge with an opening of 41 feet. The first three have a clear height above mean water level of 13 feet when closed.

Three bridges cross the Parnitz between the Dunzig-Parnitz Canal and the Oder; two are railway swing bridges with openings of 41 feet, and the Parnitz Bridge, lift, with an opening of 57 feet.

A lift bridge with an opening of 32 feet crosses the Grüne Grahen.

Pilots.—The harbor pilots guide the transporting of vessels in Stettin Hafen; they, however, only act as adviser of the master of the vessel, who is responsible for the maneuver and for any damage done. The pilot, shipping, and harbor police offices are in the new government buildings on the Hakenterrasse. Important Notices to Mariners are posted up in these buildings.

Stettin, situated on the left bank of the Oder, is the capital and most important manufacturing town of Pomerania, the chief commercial port of Prussia, and the outlet for the manufactures of Silesia, conveyed down the Oder from Frankfort and Breslau. The principal industry is shipbuilding; others are cement works, soap, oil, and tallow factories, various food industries, chemical works, iron works, etc. It contained in 1910 a population of 236,113 and a strong garrison.

Communication.—There are direct lines of steamers to all the important Baltic ports, London, Hull, Newcastle, and Leith; also to North America, France, Spain, and the Mediterranean. There is communication with the interior by four lines of railway, and extensive telegraph accommodation; the telegraph office is always open. Over 500 statute miles of light railways have been made to the eastward of Stettin, and electric trains extend throughout the whole of the city and suburbs.

Stettin, besides being the chief German port in the Baltic, is also the nearest port by rail and canal to Berlin, the distance by rail being about 60 statute miles, or two and a half hours' journey; by water Stettin is 120 statute miles from Berlin.

The Oder River extends a considerable way from Stettin toward the capital, the remaining distance being completed by a canal; by this means imperishable goods are carried more cheaply and quickly than from Hamburg, and by rail the freight is considerably less to Berlin than from Hamburg, the distance being only about half as great. The Oder is navigable to Ratibor, a distance of about 375 miles.

A new canal, 58 miles long and 7½ feet deep, is now building between Stettin and Berlin and is expected to be open at the end of 1912; it will be available for lighters carrying 600 tons dead weight.

Docks and patent slips.—See Appendix I.

Repairs.—There are several large shipbuilding yards at Stettin, and the facilities for repairs of all descriptions to hull and machinery are very good. The largest vessels and their machinery can be built and repaired.

The Vulcan Co. undertakes all repairs to vessels using their floating docks; they have two steam floating cranes which will lift 150 and 30 tons, respectively. At the yard of the Stettiner Oderwerke, at Grabow, there is a floating dock and an electric fixed crane of 30 tons, also hand cranes of 20, $3\frac{1}{2}$, and $2\frac{1}{2}$ tons. In the government yard, between Bredow and Grabow, government vessels are repaired chiefly: there is a slip and a 5-ton crane; lighters for weighing sunken vessels are available. Divers can be obtained from the authorities if not wanted for municipal work.

About 70 tugs are available, also lighters of 100 to 600 tons.

Time signal.—A black ball, 5 feet in diameter, on the northern tower of the government buildings at Stettin, is dropped at noon, mid-European mean time, corresponding to 23h. 0m. 0s., Greenwich mean time, from a height of 240 feet above the water and 178 feet above the ground, drop $12\frac{1}{2}$ feet. The ball will be hoisted half way up 5 minutes previously and fully up 3 minutes previously.

Should the signal be inaccurate, a red ball 16 inches in diameter will be hoisted within 3 minutes of the failure of the time signal, upon one of the wire stays of the time-ball structure, for 5 minutes. Should the ball fail to drop, the red ball will be hoisted half way up within 3 minutes of the signal time prescribed, and remain in this position until the time ball is lowered. If the issue of the next prescribed signal does not appear to be assured, the red ball will be hoisted half way up, and remain thus until the interruption is removed.

If the signal is omitted at the time given, it will be made an hour later, at 1h. 0m. 0s. mid-European mean time, equal to 0h. 0m. 0s. Greenwich mean time.

Supplies.—Provisions and ships' stores can be obtained. The town water supply furnishes filtered Oder water; there are various standpipes on or near the sea walls. Water for boilers can be pumped in from the Papenwasser.

Coal.—A large quantity of coal is imported annually, about 86,000 tons being usually kept in stock. There are also about 4,000 tons of patent fuel. There is a coal wharf 1,600 feet long, with a depth of 22 feet alongside.

There are coal stores in several places on both sides of the Oder: at the large store on the right bank opposite the government yard at Grabow, coal can be wheeled on board large vessels; at the coal store on the left bank below Grabow Freistaden it is put on board by steam cranes. Vessels can also be coaled from lighters. About 1,200 tons can be loaded in 24 hours.

Trade.—The chief imports are coal, iron ore, pig and wrought iron, salt herrings, lime, petroleum, wood, flour, wine, paving stones, phosphates, etc.

The most important articles of export are sugar, cement, machines, timber, flour, spirits, pig and wrought iron, potatoes, grain, oil, paper, petroleum, etc.

Storm signals are shown at Stettin from a boat in the vicinity of the Hansa Pier.

Sailors home.—A home receives seamen of all nations on payment of 10½ marks per week.

Oder Canal.—The Oder Canal, which goes round the city of Breslau, is available for vessels of 400 tons.

Dammsche See, lying to the northeastward of Stettin, is about 8½ miles long north and south, and from 1 to 2 miles wide. The depths over the greater part are from 1½ to 2 fathoms, and 1½ and 1½ fathoms in the southern part. The following channels lead from the Oder into the Dammsche See: (Cameel (Kamel) Strom, Babbin Strom, Swante, Dunzig River, the Parnitz and Great Reglitz Rivers with a common entrance called the Mönne, and the Fährgraben. The entrances to the Dunzig and Mönne, in which the depths increase from 2 to 4½ fathoms, as well as the entrance to the 8-foot-deep Fährgraben, are through dredged channels.

Beacons—Buoys.—The approach to the entrance of the Swante, Dunzig, and Fährgraben is facilitated by leading beacons, the front having triangular, and the rear, square top marks. The dredged channel to the Mönne Entrance is marked by a black rear beacon with kite-shaped top mark and two red front beacons with rectangular top marks; the rear beacon between the two front beacons leads through. Two buoys mark the commencement of the dredged channel to the Dunzig, and also of that to the Fährgraben; the new channel into the Mönne is marked by three pairs of buoys, the outer pair marked "M."

Compass adjustment.—A dolphin is situated in the Babbin Strom, about 700 yards southward of the entrance to the Königsfahrt, for vessels to make fast to in order to adjust compasses; three dolphins on each side of the channel are used for hauling the vessel round. As the swinging room is limited, being only 279 feet westward and 246 feet eastward, it can not be used by large and long vessels.

The following are the bearings and distances of the more distant churches from the dolphin:

Gollnow, 66° 30', distant about 7½ miles.

Damm (Altdamm), 172° 15', distant about 7½ miles.

Jasenitz, 324°, distant about 5.7 miles.

Little (Kleines) Haff and Great (Groszes) Haff, together named the Stettiner Haff, are formed by the Oder, where it discharges into the Baltic by the three branches, the Peene, Swine, and Dievenow; they are about 26 miles in length from west to east, with a

greatest width in the Little Haff, the western of the two, of 8 miles, and in the Great Haff of 12 miles.

Depths.—In the Little Haff there are depths up to $3\frac{1}{2}$ fathoms, and in the Great Haff up to $3\frac{1}{2}$ and 4 fathoms, which depths are in the dredged channel from the Kaiserfahrt to Leithohn. The channel between Woitzig Haken and Repzin Haken, which connects the two Haffs, has a depth of $3\frac{1}{2}$ to 5 fathoms. The depths run off irregularly, and only small vessels can approach the shores.

The least depths in the buoyed main channels in the three branches of the Oder are: Peene River, $7\frac{1}{2}$ feet; Swine, 23 feet; and Dievenow, $6\frac{1}{2}$ feet.

Ice.—The average number of days on which ice was present in the Stettiner Haff during each of the eight winters from 1903-4 to 1910-11 was 61.2; maximum 112 days in 1908-9 and minimum 11 days in 1909-10. During the winter of 1908-9, which was very severe, navigation was closed to sailing vessels on 96 days, and in the following winter on 7 days only.

Shoals.—Most of the shoals are buoyed, for which see the chart.

Woitzig Light Vessel, in $4\frac{1}{2}$ fathoms, off the southern end of Woitzig Haken, shows 2 fixed white lights, vertical, at an elevation of 31 and 21 feet, respectively, visible 7 miles. The vessel is red, with *Woitzig* in white letters on the sides, and has one mast, with two red balls at the masthead. The vessel is withdrawn in winter, its place being taken by a white spar buoy, marked "Woitzig," with bush topmark.

Fog signal.—In thick or foggy weather a bell is sounded. (See Light List.)

Gun practice.—Firing is sometimes carried out over the Little Haff: the limits of the danger zone will be marked by spar buoys with green-red flags; green cylinders will be hoisted at the Woitzig and Elb und Bock Lightvessels, and on the two praams anchored on the southern limits; the steamers stationed on the boundary of danger will hoist a green flag. When the green signals are hoisted the district bounded by sparbuoys must be evacuated at once. Flag signals will be made by the steamers, lightvessels, and praams, and light balls will be fired as warning signals; these signify as follows: Red, stop immediately; white, increase speed; red-white, turn back at once.

Directions through Little Haff.—Vessels from the Peene River steer 104° from the "Bock" Beacon Buoy, to pass southward of the Elb und Bock Lightvessel, then 101° through the Little Haff until Zirowberg, a wooded hill near Ahlbeck, is seen on the eastern side of the Golm, a hill on the northern side of the haff, when a course 115° leads between Woitzig and Repzin Hakens, and southward of Woitzig Light Vessel, into the Great Haff, until the Kaiserfahrt leading

beacons come into line, when proceed to Swinemünde or Stettin through the dredged channel across the haff.

The Ücker River, on the southern side of the Little Haff, has a depth of 13½ feet between the town of Ückermünde and the mouth, and is connected with the haff by a canal 328 yards long and 36 yards wide, with the depth just mentioned. The entrance is buoyed on both sides, the outer pair of buoys lying about 1,600 yards from the shore.

Light.—An occulting light with white and red sectors, elevated 36 feet above the sea, is exhibited from a white wooden tower with black lantern, 36 feet high, on the inner end of the west mole. The white light is visible 7 and the red light 3 miles; it shows white over the fairway and red on each side. Unwatched. (For details see Light List.)

Storm signals, both day and night, are shown from a signal mast on the western side of the entrance to the Ücker Canal.

Ückermünde, a town of about 7,000 inhabitants, lies on the left bank of the Ücker, about 1½ miles from its month. There is a sea wall 683 yards long, with a depth of 13½ feet off it.

Communication.—There is railway communication with Stettin and Stralsund, and also by steamer with Stettin, via Neuwarp.

Trade.—Coal and colonial goods are imported, and bricks exported.

Altwarp and **Neuwarp** are villages situated on the western and eastern sides, respectively, of the entrance to the Neuwarp See. The depth in the channel to both places is 9½ feet.

Beacons.—A large white beacon, with square top mark, northward of Altwarp, in line with a red beacon with rectangular top mark, northwestward of the same village, gives the direction of the channel to Altwarp between the Repzin and Kirch Haken, and also leads to the Woitzig Light Vessel.

Two small beacons, the northern white and the southern red, situated on the shore northward of Altwarp, in line, lead to the landing pier at that place.

Two small beacons on Altwarp landing pier, in line, mark the channel to the Neuwarp Pier.

Buoys.—The entrance into the Neuwarp See is divided into two channels by Kahleberg Island. The western channel is well buoyed as far as Neuwarp; a red beacon buoy, with ball top mark, marked "Neuwarp," is the distinguishing buoy from seaward.

Light.—A fixed, unwatched light, with white, red, and green sectors, elevated 16 feet, is exhibited from a lamp post on the head of the northern landing pier at Neuwarp, and shows white over the buoyed channel, green to westward, red to eastward, from October 1 to April 1.

Great Ziegenort Hafen, on the northwestern side of the Papenwasser, consists of a channel 100 yards long and 49 feet wide, besides a basin nearly the same length and 164 feet wide. The railway hafen, southeastward of the Hafen Channel, is over 100 yards long and 49 feet wide. An outer hafen is formed by moles, and is protected by a breakwater 656 yards long in a northwest and southeast direction.

The depth in the hafen is $9\frac{3}{4}$ feet.

The hafen is approached from the Great Haff through a channel over a mile in length in a south-southeastern direction, with a width of 44 yards and a depth of $9\frac{3}{4}$ feet; a dredged channel of the same width and depth as the above and 1,300 yards in length connects the hafen with the Papenwasser to the southeast.

Lights.—Two fixed red leading lights are shown at elevations of 64 and 34 feet, respectively, from wooden beacons; the rear or southern beacon is 69 feet high, black, with diamond top mark; the front or northern beacon is a red pole, 48 feet high, with triangular top mark. The lights are visible 2 miles, and are unwatched; they are not lighted when the hafen is obstructed by ice. In line they bear 150° .

Beacons.—Besides the leading light beacons, there are two leading beacons northward of the village, which, in line, lead through the southeastern part of the channel from the Papenwasser to the hafen.

Buoys.—A black beacon buoy, marked "Ziegenort N.," with ball topmark, serves as fairway buoy for the northern entrance, and a red spar buoy with flag, marked "Strewsort," at the southeastern entrance. The channels are buoyed on both sides.

Great and Little Ziegenort are two villages joined together with about 2,000 inhabitants. There is regular steamer communication with Stettin.

Storm signals.—At the storm warning station at Great Ziegenort only storm warning telegrams and weather reports are posted up. The signal mast stands on the north point of Leitholm, to which place the warnings are transmitted by telephone.

Life-saving.—A lifeboat is stationed at Little Ziegenort.

Lebbin.—The village of Lebbin is situated on the hilly southwestern point of Wollin Island, on the northern side of the Great Haff, and at the entrance to the Great Vietzig See; it has large cement works, and northward of it is a village called Kalkofen. In the neighborhood of both villages are chalk pits. Canals from $6\frac{1}{2}$ to $9\frac{3}{4}$ feet deep, with sea walls, lead to the loading places at the works.

Lights.—Two fixed white lights, elevated 250 and 182 feet, respectively, above the sea, are shown from two wooden beacons about 400 yards eastward of Lebbin Church. The rear beacon, 29 feet high, is white, with a red square topmark; the front beacon, 15 feet high,

is white, with white triangle as topmark. These lights in line cut the Krickshaken Buoy, and are for the use of the cement works steamer when entering the Swine; they are the property of the works.

Beacons.—On the Lebbin Hills are several beacons which serve for rounding Krick Haken and Krick Schaar. The entrance to the Swine by Vietzig Ort, and that from the haff through the Quer Strom, are also marked by leading beacons. The channel to Lebbin, and farther northward to the sawmill, on the Little Vietzig See, is well buoyed; see the chart. The southeastern part of the Swine, eastward of the Kaiserfahrt, is now only used for local traffic.

Paulsdorf Bucht, on the eastern side of the Great Haff, is approached through a dredged and buoyed channel 44 yards wide and 11½ feet deep, between Wollin Schaar and Pommersche Schaar. The depths in the bucht are from 1½ to 2½ fathoms.

Lights.—Two fixed white leading lights, elevated 110 and 83 feet above the sea, respectively, visible 11 miles, are exhibited from two beacons 445 yards apart near Paulsdorf. The rear beacon is a red pole 56 feet high standing in front of a windmill; the front beacon, 33 feet high, is white with diamond topmark. In line bearing 82° they lead through the dredged channel into Paulsdorf Bucht.

Beacons.—By day the windmill behind the rear leading beacon, just described, may be used instead of it.

Two leading beacons at Sagar, the front one white with triangular topmark, point upward, and the rear beacon, red with rectangular topmark, lead toward the Tiefen Zug from the Wollin Schaar. The beacons are 70 and 97 feet high, respectively, above the sea. On the south point of Der Roof Peninsula is a red beacon with topmark of two rectangular boards, one above the other.

Bell buoy.—A red and black bellbuoy, marked "Dievenow," with ball topmark, lies in the Great Haff, off the entrance to the dredged channel into Paulsdorf Bucht, as Fairway Buoy.

Leitholm is an island in the entrance to the Papenwasser from the Great Haff, and lies on the southwestern side of the Schwantewitz Haken. It is raised for regulating the current. The western side is sheet piled, the eastern side is protected by reed plantations. On the northern and southern ends are moleheads, on which are the light beacons previously described. There is a small refuge harbor on the southern side of the island, behind the mole, which can be entered by steamers drawing 8½ feet.

Storm signals, both day and night, are shown from a mast on the northern end of the island.

Great Stepenitz Railway Hafen, at the head of Stepenitz Bucht, on the east side of the Papenwasser, is 164 yards long, 44 yards wide, and is formed by two moles. It is approached from an east-northeast direction by a channel 33 yards wide, with a least depth of

9 $\frac{3}{4}$ feet, which is also the depth in the hafen. Northward of the railway hafen is the new winter hafen. The village of Great Stepenitz lies near the hafen.

The short Stepenitz Canal is over 800 yards long, 59 feet broad, and 7 $\frac{1}{4}$ feet deep. It has public and private berthing places.

Beacons.—Two range beacons stand on the shore at the head of the hafen. The front beacon is red with diamond topmark and the rear white, with triangle, point downward. In line they lead through the channel and into the hafen. The entrance to the channel is marked by two buoys about 400 yards outside the mole heads.

Communication.—There is a railway from the hafen to Gölzow, and regular steamer traffic with Stettin and intermediate stations.

Oder Bank.—The southern extremity of this bank lies about 12 $\frac{1}{2}$ miles 21° from Swinemünde East Molehead, and has within the 5-fathom curve a breadth of 1 to 3 miles for a distance of 7 $\frac{1}{2}$ miles in a northerly direction; thence it extends 9 $\frac{1}{2}$ miles to the northward, with an extreme breadth of about 15 miles, with several off-lying heads, with less than 5 $\frac{1}{2}$ fathoms on them, extending another 5 miles to the eastward. The bank has general depths of 3 $\frac{3}{4}$ to 5 fathoms, fine sand, in its northern part, and of 3 $\frac{1}{4}$ to 5 fathoms in the southern portion.

Light and whistle buoys.—The northern side of the Oder Bank is marked by a white light and whistle buoy in about 7 fathoms, with a red north top mark (2 triangles, bases downward), and marked "Oder Bank N.," exhibiting a group occulting white light, with 1 group of 2 eclipses every 15 seconds—thus, light 8 seconds, eclipse 2 seconds; light 2 seconds, eclipse 2 seconds.

The southern end of the bank is marked by a white light and whistle buoy in about 6 $\frac{1}{2}$ fathoms, with a red south topmark (2 triangles, bases upward), and marked "Oder Bank S.," exhibiting a group occulting white light, with 1 group of 2 eclipses every 15 seconds—thus, light 8 seconds, eclipse 2 seconds; light 2 seconds, eclipse 2 seconds.

Light buoys.—The southwestern side of the Oder Bank is marked by a white light buoy in about 8 fathoms, with red west topmark (2 triangles, bases away from each other), and marked "Oder Bank S. W.," exhibiting an occulting white light every five seconds—thus, light 3 seconds; eclipse 2 seconds.

The southeastern side of the bank is marked by a white light buoy in about 8 fathoms, with red east topmark (2 triangles, bases together), and marked "Oder Bank S. O.," exhibiting an occulting red light every 5 seconds—thus, light 3 seconds; eclipse 2 seconds.

Buoys.—The western side of the Oder Bank is marked by a large white spar buoy, with "Oder Bank W." on it, and surmounted by 2 triangles with their apex toward each other.

A large white spar buoy, with "Oder Bank O." on it, and surmounted by 2 triangles, with their bases toward each other, is moored on the eastern side of Oder Bank.

Caution.—In a heavy sea the topmarks of the buoys may be carried away and the lights extinguished; the latter will be relighted as soon as the weather permits, but, as some time may elapse, dependence can not always be placed on their burning.

The coast from Swinemünde trends in an easterly direction 153 miles to Rixhoft, and consists chiefly of sand dunes, some of which on the eastern part attain a height of nearly 200 feet; on some parts of the coast where the sand hills and the land behind are low, there are several lagoons joined to the sea by small shallow streams; inland there are isolated hills and ranges which can be seen from a long distance seaward.

With few exceptions, the shore is free of dangers, the water gradually shoaling toward the shore; but within the 5-fathom curve, which is scarcely 1 mile from the shore in some parts, the water shoals suddenly. The bottom near the shore consists of fine gray or white sand, thence to the 20-fathom curve a coarser sand of a brown color, and beyond of gray mud and clay.

Between Swinemünde and Rixhoft there are three small harbors—Kolberg, Rugenwaldermünde, and Stolpmünde.

Misdroi (Misdroy), situated 6 miles eastward of Swinemünde, is a much-frequented watering place and is easily recognized from seaward by its large white buildings, and during the summer several bathing establishments are erected along the shore. There are two landing piers. The southwestern has a depth of 13½ feet at the end, and the other is only used by fishing boats. In summer there is steamer communication with Swinemünde and Stettin.

There is a railroad to Swinemünde and Wollin.

Fog signal.—A gong at the pierhead is sounded when the regular excursion steamers are approaching.

Life-saving.—A lifeboat and rocket apparatus are stationed at Misdroi.

Storm signals, both day and night are shown. About 2 miles northeastward of Misdroi there is a densely wooded steeply sloping point named Swinhoft.

Kiesberg Beacon, situated just within the forest, at 3 miles east-northeastward of Swinhoft, is a massive white cylindrical tower, 52 feet high, with a black roof and vane; eastward of this beacon the shore diminishes in height.

Storm signals, both day and night, are shown at Kiesberg, from the mast near the beacon.

Life-saving.—There is a lifeboat and rocket station 1½ miles westward of Kiesberg Beacon.

A patch of $4\frac{3}{4}$ fathoms, but stated to have $26\frac{1}{4}$ feet, lies about $5\frac{1}{4}$ miles northward of Kiesberg Beacon and must be avoided by vessels of deep draft.

Dievenow River.—The eastern of the three mouths of the Oder, named the Dievenow, flows from the Great Haff past the town of Wollin, through the Cammin (Kamminer) Bodden and the Frit-zower See, then turns westward for about $1\frac{1}{2}$ miles, and discharges into the Baltic between two moles, which are situated nearly 6 miles eastward of Kiesberg Beacon, and about $\frac{3}{4}$ mile eastward of the old mouth of the river, now closed.

The least depth in the river between Wollin Schaar and West Dieve-now is $6\frac{1}{2}$ feet; in and in front of the entrance the depth is $8\frac{1}{4}$ feet at mean level, but the channel is very liable to change, and less than $6\frac{1}{2}$ feet is often found. Dredged channels westward of Gristow Island and between Cammin (Kamminer) Bodden and Berg Dieve-now have a width of 44 yards and a depth of $8\frac{1}{4}$ feet.

Landmarks.—The church and steeple at Cammin (Kammin), a town on the right bank of Dievenow River, $3\frac{1}{2}$ miles south-southeastward from the entrance, two high chimneys at Bünnewitz on Gristow Island, west of Cammin, the high chimney near East (Ost) Dieve-now, and the church of Berg Dievenow, are good marks for recognizing this part of the coast.

Beacons.—A white beacon, 13 feet high, with triangular topmark, stands on the western molehead, at the entrance to the Dieve-now.

A beacon with triangular topmark stands on the point at Falkenberg, to the eastward of the sharp turn in the channel named Falkenberg Enge (Narrows).

Buoys.—A black and red beacon buoy, with ball topmark, marked "Dievenow," lies off the entrance to the river from the Baltic, in 3 fathoms, about 55 yards westward of the line of leading lights, and a black conical buoy lies opposite the west molehead.

The channel is well buoyed, for which see the chart. As it is liable to constant change, and a pilot or local knowledge is necessary, no directions are given.

Leading lights, 172 yards apart, are placed to guide vessels from sea to the entrance of the Dievenow River as far as the head of the west mole. The front light, fixed red, is exhibited at an elevation of 23 feet above the sea from a mast near the inner end of the east mole. The rear light, fixed white, is exhibited at the height of 33 feet above the sea from a mast situated southeastward of the front light. These lights are shown from April 6 to December 31.

Pilots.—There is a pilot station at West Dievenow, a village situated on the left bank of the last reach, about $\frac{1}{2}$ mile within the entrance, maintained principally to warn vessels approaching the

coast and mistaking the spires of Cammin for those of Swinemünde. These pilots will conduct vessels to Swinemünde or through the Dievenow to Cammin, and Wollin, 9 miles beyond.

West Dievenow is a fishing village on the left bank of the Dievenow River. The fishing haven, with a depth of 9½ feet, lies about 800 yards westward of the village, just inside the entrance to the river.

East (Ost) Dievenow Village, on the right bank, opposite West Dievenow, is a watering place, and has a Kurhaus.

Berg Dievenow, a village and watering place, lies eastward of East Dievenow, and 1½ miles from the entrance to the river.

Life-saving.—A lifeboat and rocket apparatus are stationed at Berg Dievenow.

Storm signals, both day and night, are shown from a mast on the high dune near the inner end of the east mole, and also at Berg Dievenow.

Cammin (Kammin), a town on the east bank of the Dievenow, has communication by railway with Stettin and Kolberg, and by steamer with Stettin, and with Berg Dievenow in the bathing season. A lift bridge crosses the branch of the Dievenow between the mainland and Gristow Island: it has a passage through, 26 feet wide, which is opened for passing vessels on demand, in the daytime.

Gristow Island—Range lights.—Two private electric lights have been established at Bunnewitz, Gristow Island, at the entrance to the channel to the Portland Cement Works.

Wollin, a town on the western bank of the Dievenow River, about 2 miles within its southern entrance in Paulsdorf Bucht, has about 5,000 inhabitants. The Dievenow is crossed here by a drawbridge and a railway swing bridge. The drawbridge has an opening 38 feet wide, and is opened for steamers at any hour; a vessel approaching must make a clear signal from the fore part by means of a bell or white flag, or verbally, five minutes at the latest before her arrival. Red balls at the bridge indicate that the passage is obstructed.

The railway bridge, which has an opening 44 feet wide, is closed in the daytime 20 minutes before the departure of a train from Wollin, or from Hagen, on the opposite bank, and opened after it has passed. The bridge is closed from 10h. 30m. p. m. to 5h. 30m. a. m., and in winter as long as navigation is suspended.

The following signals for vessels passing are shown from each head of the swing-bridge pier:

Bridge closed.—By day and in clear weather a red ball hoisted on a staff; at night and in obscure weather a red light in the same position.

Bridge open.—By day and in clear weather the red ball is not hoisted; at night or in obscure weather a green light is shown.

Communication.—Wollin has railway communication with Stettin and Kolberg, also with Swinemünde, via Misdoir; there is regular communication by steamer with Stettin and Cammin.

Coast.—Between Berg Dievenow and Hoff Village, 8 miles farther eastward, the coast consists of low sand hills with forest. Hoff Church stands on a steep bank close to the shore; this bank extends nearly 3 miles in an easterly direction to Horst Village. Hoff, Revahl, and Horst Villages are watering places, and are connected by light railway with the line from Stettin to Kolberg.

Life-saving.—A rocket apparatus is stationed at Hoff.

Gross Horst Light.—On Gross Horst stands an octagonal tower, with red and yellow vertical stripes, over a dwelling, 148 feet high, from which, 206 feet above the sea, is exhibited a flashing white light, visible 20 miles. Within the distance of 6 miles the eclipses are not total. There is a telephone station at the lighthouse. (For details see Light List.)

Storm signals, both day and night, are exhibited here.

Rega River.—About $1\frac{1}{4}$ miles east of Gross Horst Light lies the outlet of Horst Eiersberg See, a lake $1\frac{1}{4}$ miles in extent, between which and Rega River, about 7 miles eastward of it, there are low sand dunes.

The entrance to Rega River lies between the villages West and East Deep, and is only accessible to boats. Abreast the entrance to the river depths under 5 fathoms extend off 1.7 miles, with a patch of $3\frac{1}{4}$ fathoms about $1\frac{1}{4}$ miles from the shore, and one of nearly $4\frac{1}{2}$ fathoms nearly 3 miles off.

Landmark.—On the left bank of the Rega River, and about $4\frac{1}{4}$ miles from the coast, is situated the town Treptow, the church of which place has the most conspicuous spire on this part of the coast.

Life-saving.—There is a rocket station at the entrance of Rega River.

About $3\frac{1}{4}$ miles eastward of Rega River there is the entrance to a lake named Camp (Kamper) See, separated from the sea by a narrow beach, through which there is a small outlet.

Shoals.—Abreast Camp (Kamper) See and the village of Colberger (Kolberger) Deep, eastward of it, the 5-fathom curve extends nearly $3\frac{1}{4}$ miles from the shore. Within 2.3 miles of the shore there are several shoals, the northernmost of which has a depth of $2\frac{3}{4}$ fathoms. Nikolai Church in Kolberg, bearing 105° , leads northeastward of the bank.

Kolberg Hafen.—The haven channel of Kolberg, situated at the entrance to the Persante River, is about 650 yards long and 40 yards wide; the sides are lined with wooden quays, terminating in two stone moles which extend and curve a little in a north-northwest direction. The western mole is about 250 yards long, having on the

molehead a black post surmounted by an iron cage as top mark. The eastern mole is 325 yards long, with a similar beacon, painted black, on its outer end; a signal beacon with red ball stands near the middle part and a signal staff on the inner end of this pier. The eastern mole extends 55 yards farther seaward than the western. At the head of the west mole the width of the entrance is 46 yards, narrowing inward to 36 yards. The breastwork wall of the east mole is painted white.

On the east bank of the hafen is a seawall, 547 yards long, with depths up to 16 feet off it. On the seawall is a crane that will lift 2 tons. Vessels drawing $12\frac{1}{2}$ feet and 203 feet in length can turn in the hafen.

A fishing harbor is situated at the inner end of the west mole, and a winter harbor on the east bank of the Persante. Important notices are posted up at the pilot office.

Depths.—The depth in the entrance averages $15\frac{1}{4}$ feet, but may be reduced by sand deposits to 13 feet, and again increased by current and dredging to $17\frac{1}{4}$ feet. In general the depth in the entrance is so maintained that it amounts to $14\frac{3}{4}$ feet at least.

Above the winter harbor the river has only an average depth of 6 feet.

Current.—The coast current sets across the entrance; with winds from north, through east, to south-southeast it sets westward, and with winds from north, through west, to south-southwest it sets eastward. There is very little current with winds between south-southeast and south-southwest. The coast current is strongest with gales that blow parallel with the coast, and may reach a strength of 3 knots.

The river current sets constantly outward; its velocity after continuous rains often amounts to 3 knots, but may reach 8 knots when the ice is in motion.

Ice.—The entrance to the Persante is free from ice longer than the entrances to the Swine and Wipper. Only during very severe cold and on-shore winds is the hafen closed in the daytime by ice, which drifts out again quickly with offshore winds.

Water level.—With gales between northwest and northeast through north, the water rises to $3\frac{1}{4}$ feet, and falls about as much with gales from southwest to south-southeast through south. These levels occur only in spring, autumn, and winter, with heavy gales, otherwise the water level varies between about 1 foot above and below mean level.

Surveying beacon.—A framework beacon for surveying purposes stands on the highest point of the flat, about $3\frac{3}{4}$ miles 115° from Fort Münde. It is 131 feet in height above the ground, and it is proposed to eventually replace it by a fixed trigonometrical mark.

Lights.—Near the inner end of the east mole, from a gray octagonal tower on the southwest angle of the pilot watch house, 62 feet in height, a group occulting white light is exhibited 83 feet above the sea, visible 14 miles. (For details, see Light List.)

Fixed red and green lights are also shown, at the height of 39 feet, from the fog-signal house and the beacon on the East and West moleheads, respectively, visible 6 miles. These lights are unwatched.

Fog signal.—A fog signal is sounded on the East molehead.

Signals.—A red pendant at the pilot signal masthead signifies that the entrance to the haven is clear.

Storm signals are shown at Kolberg by day.

Wind signals.—A pillar has been erected at Kolberg with three arms to indicate the direction and force of the wind at Arkona and Brüster Ort; the direction of the wind is indicated by letters between the two upper arms, and the force by figures between the lower arms. When the signal refers to Arkona only, one arm is extended; to Brüster Ort only, two arms are extended; and when it refers to both stations, all these arms are extended.

Tide signals are made from the pilot signal mast, but not constantly. The signals for rise, high water, and fall are not made.

Danger signals for fishermen.—To notify to fishermen that danger threatens, one or two square shapes are shown from the left yardarm (as seen from sea) of the pilot signal mast.

One square is a warning for open boats to return, as the sea is increasing.

Two squares, one above the other, signify entrance highly dangerous for decked cutters; keep at sea or seek shelter elsewhere.

Signal beacon.—On the east mole is a signal beacon consisting of a movable pole with red ball on top, erected on a white iron framework 24 feet in height. When the pole is upright the height, including the ball, is 56 feet above mean water level. Usually the pole is down. If, owing to bad weather or strong coast current, the pilot can not get out to a vessel, the signal beacon is set up, and with it the course is given to the vessel approaching. The course is toward the side to which the pole with ball is inclined; if it stands upright the vessel remains steady as she goes. Signals with the beacon apply only to the one vessel that is nearest the entrance. If the beacon is not set up the entrance is dangerous or impossible.

Life-saving.—A lifeboat and rocket apparatus are stationed at Kolberg Hafen.

Pilots.—Pilotage is compulsory for merchant vessels of more than 60 cubic meters capacity. During fine weather pilots, when signalled for, meet vessels in rowing boats, flying the pilot flag. Pilots are on the lookout from early morning until late in the evening; seamen can not rely on their services at night, but should keep their vessels

under way or anchor in the roadstead. The pilot watch house, from the southwestern corner of which the lighthouse rises, is situated at the inner end of the east mole; the signal mast is close to it. No charge is made for pilotage, except for pilot's boatman assisting and shifting.

The roadstead affords good anchorage with offshore winds, in a depth of about 6 fathoms, with the lighthouse bearing 150° and distant about 600 yards from the mole end. Farther out in about 7 fathoms, with St. Marien Church, Kolberg, bearing 133° and Trep-tow Church 228° . At night anchor in about $6\frac{1}{2}$ fathoms with the white hafen light 133° and Funkenhagen Light 77° .

Directions.—When approaching Kolberg Hafen, the large building of St. Marien Church, the slender tower of the Roman Catholic Church, and the spire of St. Nikolai Church at Kolberg, will be seen at a considerable distance; on a nearer approach are seen the old Fort Münde, a red, round structure near the east mole, with the pilot watch house and lighthouse on it, the gray barracklike Strand Hotel, and farther eastward the new casino (Kurhaus) with two pointed towers of unequal height on the west front.

Bring the Marien and Nikolai Churches in line bearing 130 , and steer for them until the moles are made out; then steer to enter between the moles on a course 139° .

The risk when entering increases with onshore gales, when a pilot can not get out. If a vessel is compelled to enter, careful attention must be paid to the current setting across the entrance, according to the direction of the wind, while bearing in mind so to approach that a straight course will lead in, otherwise there is danger of being set against one of the moles, under the influence of the currents out of the river and along the coast, which meet off the moleheads. Hawasers must be ready and the speed reduced inside the moles.

When a pilot can not proceed out, signals denoting the course to be steered will be made with the signal beacon, and the pilot will board the vessel inside the molehead.

The depth of water in the harbor will be shown by signals.

In heavy gales from west-southwest to east-northeast, through north, the entrance is hardly possible on account of the high sea and narrow entrance. In such circumstances vessels should remain at sea.

If the weather be so stormy that it is dangerous for vessels to enter the harbor, no signal is shown, neither the entrance pendant nor the balls indicating the depth of water nor the red ball on the signal beacon.

At night steer 133° toward the white hafen light until in about 7 fathoms and anchor to await a pilot. To attempt making the harbor during the night is dangerous, as there is great difficulty in distin-

guishing the moles on account of the shrubs and trees extending along the shore. In fine weather, however, when the molehead lights are burning, it is not dangerous.

Kolberg, a garrison town with 24,909 inhabitants (1911), is much frequented as a watering place. It is principally engaged in shipping. Chemicals and soap are manufactured. There is a hospital and a large casino.

Communication.—There is railway communication with Stettin, Belgard, and Danzig, and by light railway with Rügenwalde; also by steamer regularly with Stettin. There is communication by telegraph and by telephone with Berlin and Stettin. The telegraph office is always open.

Coal.—About 400 tons of coal are in stock, and can be brought alongside in railway cars.

Water.—Fresh water for drinking can be had by hose from the town supply. There are two standpipes at the haven. Water for boilers can be obtained from the river.

Patent slips.—See Appendix I.

Repairs to iron vessels and machinery can be carried out to a moderate extent. There is an iron foundry and also an engine-building establishment. The harbor authorities possess a floating hand crane to lift 12½ tons, which is stationed at Rügenwaldermünde and sometimes at Stolpmünde.

Divers can, as a rule, be obtained from the harbor authorities during the summer.

Trade.—The imports are principally coal, herrings, manure, piece goods, and paving stones from Sweden; the principal exports are grain, potatoes, and wood.

Funkenhagen Light.—Near Funkenhagen Village, 11 miles eastward of Kolberg, stands a circular tower 168 feet high, from which, 16½ feet above the sea, is exhibited a group occulting white light visible 19 miles. (For details see Light List.)

Life-saving.—There is a lifeboat and rocket station at Funkenhagen.

The coast.—From Funkenhagen the coast trends in an easterly and northeasterly direction, 22 miles to Rügenwaldermünde.

Along this part of the shore the depths decrease gradually toward the 5-fathom curve, which does not extend beyond $\frac{1}{2}$ or $\frac{3}{4}$ mile from the beach. Behind the low sand dunes, between Funkenhagen and Rügenwaldermünde, there are two large lakes, named Jamundsche (Jamunder) See and Bukowsche (Bukower) See, with shallow outlets to the sea; and about 5½ miles inland there is an isolated, densely-wooded hill, 492 feet high, named Gollen Berg.

A red lookout tower, constructed of masonry, 103 feet in height, and showing about 38 feet above the tops of the trees, has been

erected on the apparently highest point of the Gollen Berg, and can be seen from the sea.

At the foot of the western declivity of this hill will be seen some chimneys and a high church steeple of the town Köslin.

Nest.—Storm signals are shown by day at Nest, about $7\frac{1}{2}$ miles eastward of Funkenhagen; the signal mast, with yard, stands on a dune over $\frac{1}{4}$ mile from the beach.

Rügenwaldermünde Hafen, at the entrance to the Wipper River, has an outer and an inner haven.

The outer haven is triangular in shape and is formed by two moles which extend in a northwesterly direction for about 400 yards, their inner ends being about 400 yards apart with an entrance between the moleheads 124 feet wide, open to the northwestward.

On each molehead there is a beacon, consisting of a black iron post, surmounted by a wrought-iron cage.

A red beacon buoy, with ball topmark, 44 yards outside the river entrance, marks the submerged remains of the old west mole and must be left to starboard on entering the inner haven; it is removed in winter.

The inner haven, formed by the mouth of the Wipper, extends from the head of the old west mole, which projects into the outer haven, to the drawbridge over the river. The entrance between the nearly parallel old moles is from 65 to 75 feet wide. The haven is 372 yards long in a 134° true direction and 65 feet wide at the narrowest part between the quays that line the banks on either side. There is a 2-ton fixed crane on each side of the haven.

The drawbridge across the river at the head of the town has an opening 35 yards wide; above this bridge on the left bank there is a good winter harbor with 10 feet water.

Important Notices to Mariners are posted up at the pilot office.

Depths.—The depths over the greater part of the Outer Hafen are from $1\frac{1}{2}$ to $2\frac{3}{4}$ fathoms. Before the entrance the depth is about 16 feet: it may be decreased by sand deposit to 13 feet, but is again increased by dredging and current to 16 feet, which is also the depth in the channel through the outer haven.

The inner haven has 16 feet outside it, decreasing inwards to $14\frac{3}{4}$ feet. The depth in the haven entrance is maintained at $14\frac{3}{4}$ feet at least.

Lights.—Near the inner end of the East Mole a group occulting white light elevated 40 feet above the sea and visible 6 miles is exhibited from a square tower 41 feet high, upper part red and lower part gray. The fairway of the outer haven entrance bears 291° from this light. (For details see Light List.)

At the east molehead a fixed red light is exhibited and at the west molehead a fixed green light; the lights are shown from the mole-

head beacons at an elevation of 39 feet above the sea and are visible 6 miles in clear weather. These lights are unwatched.

Fog signal.—A bell is sounded occasionally at the old West molehead for local purposes. (See Light List.)

Water level.—Gales from north to northeast may raise the water about 5 feet above and those from southwest may lower it about 2 feet below mean level. Such variations, however, seldom occur, and only with extraordinary weather conditions. The usual variation in the level is from 16 inches above to 4 inches below the mean.

Ice.—The entrance to the Wipper is free from ice longer than the Swine; the outgoing current hinders the formation of ice. From the entrance up to the drawbridge the haven remains ice-free as long as fixed ice does not form in the sea.

Current.—The current on the coast sets across the entrance to Rügenwaldermünde Hafen to the northeast, with winds from south-southwest through west to northwest, and to the southwest with winds from north-northeast to east-southeast; it is strongest with gales parallel to the coast, and then reaches a velocity of 2 to 3 knots. The current is very weak with winds between northwest and north-northeast, and is not perceptible with winds from a southerly and southeasterly direction, with which, however, the current from the river is noticeable. The river current runs outward as a rule, and in spring may reach a velocity of 3.8 knots.

Signals.—A red pendant, shown at the pilot signal mast at the inner end of the east mole, signifies that the entrance to the haven is clear.

Tide signals are shown as at Kolberg, but only when necessary.

Wind signals are made as at Kolberg.

Storm signals are shown by day at Rügenwaldermünde; the signal mast stands at the inner end of the old west mole; weather reports are kept at the pilot watchhouse at the inner end of the east mole.

Danger signals for fishing boats are made as at Kolberg.

Life-saving.—There is a lifeboat and rocket station at Rügenwaldermünde.

Anchorage.—Good anchorage may be obtained in the roadstead with offshore winds, in a depth of 7 or 8 fathoms, with St. Marien Church, Rügenwalde, bearing 128° ; at night in 8 or 9 fathoms, with the haven light bearing 147° .

Pilots.—Pilotage is compulsory for all merchant vessels of more than 60 cubic meters capacity. No lookout is kept after dark. In fine weather pilots meet vessels in the road in a rowing boat, flying the pilot flag; in bad weather they go off in a decked sailing boat with a foul anchor and black "R." on the mainsail.

Signal beacon on the East Mole.—The directions given for the use of the signal beacon at Kohlberg apply here; the Rügenwaldermünde Beacon, however, carries a red flag instead of a ball.

Directions.—When approaching from the eastward Jershöft Lighthouse is a good mark, and from the westward, Gollen Berg with its tower. The position of the haven is recognized by the white church tower of Zitzow (Zizow), on a hill 2 miles eastward of Rügenwaldermünde, and that of St. Marien in Rügenwalde. On a nearer approach, detached high houses of Rügenwaldermünde, and the reddish brown pilot watch house, with tower, at the inner end of the mole, are seen.

Steer 128° for St. Marien Church until the entrance to the outer haven is open and the inner side of the east mole can be seen, when steer in on a course 106°. A pilot will meet a vessel flying the pilot signal in the road.

Should the pilot be unable to come out on account of heavy sea, strong current, or other cause, the course to be steered will be indicated by the signal beacon; the pilot will then board the vessel inside the entrance. The tidal signal is shown when necessary.

In heavy gales from south-southwest, through west, to north-northeast, the entrance should not be attempted; in such circumstances neither the entrance pendant, depth signal, nor the flag on the signal beacon is shown.

At night the entrance to the outer haven is facilitated by the lights on the moleheads, but the pilots only keep a lookout in the daytime.

Rügenwaldermünde, a village at the mouth of the Wipper, has railway connection with the Stetting-Danzig Line, and regular communication with the town of Rügenwalde, by steamer, from March to November.

Coal.—About 200 tons of coal are in stock, including that at Rügenwalde.

Water.—Good drinking water can be obtained from an artesian well.

Repairs.—Small wooden vessels can be repaired; there is a small machinery workshop.

Crane.—A floating hand-crane, to lift 12½ tons, is stationed here, and sometimes at Stolpmünde.

Trade—Shipping.—The imports consist of grain, piece goods, stones, coal, kaolin, salt, poplar wood, and salt fish; the exports are grain, spirits, bran, and wood. For shipping, see Rügenwalde.

The Wipper River connects the haven of Rügenwaldermünde with that of Rügenwalde. The canal-like river bed has a bottom width of 82 feet, a surface width of 148 feet, and a depth of 13 feet; from the

drawbridge at Rügenwaldermünde to the entrance to Rügenwalde haven the distance is 1,800 yards.

Rügenwalde Hafen, on the left bank of the Wipper below the town, is 55 yards wide, with a depth of 13 feet, and has 437 yards of quay furnished with railway lines. On the east side of the haven is a 2-ton traveling crane.

Rügenwalde is a small ancient town with about 6,000 inhabitants, situated $1\frac{1}{2}$ miles within the entrance of Wipper River, its compact mass of houses and two churches form good marks for recognizing this part of the coast. St. Marien Church, with a high red roof and dark green lantern, stands in the middle of the town; at the northeast and highest part of the town, there is a smaller church, a white cylindrical building, with gray roof and small spire.

Communication.—There is steamboat communication between Rügenwalde and Stettin, and a railway with the interior.

Water for drinking is delivered at Rügenwalde from a special tank boat; the price is 1 mark per cubic meter except for the first, which is 3 marks.

Jershöft.—The coast from Rügenwaldermünde trends in a north-east direction $8\frac{1}{2}$ miles to Jershöft; about 2 miles northeastward of Rügenwalde stands Zitzow Village, on a hill 220 feet high, which is easily recognized by a church with square tower and gray spire. On a small range northeastward of Zitzow stands Barzwitz Village, between which and the coast there is a lake about $3\frac{1}{4}$ miles long named Vitter See, separated from the Baltic by a low, narrow ridge of sand hills. Rützenhagen Church, with tall steeple, 2 miles southwestward of Jershöft Lighthouse, is conspicuous. The high steep shore of Jershöft, composed of white cliffs, partly covered with wood, is easily recognized by its lighthouse and a mill close to. During the summer Jershöft is visited for bathing.

Surveying beacon.—A framework beacon, 65 feet above the ground, stands 4 miles, 190° , from Jershöft Light. It is proposed to eventually replace it by a permanent trigonometrical mark.

Light.—The lighthouse at Jershöft, a cylindrical tower, stands near the eastern end of the village and 420 yards from the shore; it is 103 feet high, and from which is exhibited 165 feet above the sea a group flashing white light, visible 19 miles. (For details see Light List.)

Fog signal.—A fog siren, worked by compressed air, is sounded. The siren is established in an iron tower at an elevation of 82 feet, and situated about 540 yards north-northeastward from the lighthouse. (See Light List.)

Signal station.—The lighthouse is a signal station.

Life-saving.—There is a lifeboat and rocket station at Jershöft.

Coast—Landmarks.—On the eastern side of Jershöft the shore is composed of low dunes, behind which there is a large lake named Vietzker See; thence to Stolpmünde the dunes are high and partly covered with wood. This part of the coast may be recognized by the church of a low-lying village named Lanzig, on the southern side of Vietzker See, the church of Marsow, and Pustaminer Mill, about 4 miles inland.

Stolpmünde will be recognized by a windmill and the spire of Stolpmünde Church, which, as well as the town, are situated on the eastern side of the harbor, and the dark-colored pilot watch house, with the lighthouse at its southwestern corner, standing near the inner end of the east mole, by several large, conspicuous warehouses, and some villas with small turrets; also a tall chimney on each side of the hafen.

Stolpmünde Hafen, situated at the mouth of the Stolpe River, 11 miles eastward of Jershöft Lighthouse, comprises an outer and an inner hafen.

Outer hafen.—The outer hafen, about 500 yards in length by nearly 133 yards in width, is formed by two nearly parallel moles, which extend from the shore in a north-northwest direction; the outer end of the western mole curves northeastward toward the eastern molehead, and between them is the entrance, 134 feet wide. About 150 yards from the head of the west mole the end of the old west mole extends 33 yards into the outer hafen, about level with the sea, and is marked at the end by several piles projecting about 10 feet above the water. The moleheads are painted white above, and have wooden fenders.

On the west molehead is a gray post beacon, 27 feet in height, surmounted by an iron cage, and on the east molehead a similar beacon.

The pilot signal mast and the signal beacon are on the east mole, near the inner end.

The depth in the greater part of the outer hafen varies from $1\frac{1}{2}$ to 3 fathoms, the least water being on the western side. The channel leads along the east mole, and is maintained at a depth of about $16\frac{1}{2}$ feet.

The depth in front of, and in the hafen entrance, is generally $16\frac{1}{2}$ feet at least; after heavy gales patches of 13 feet have been observed, which are removed by dredging.

The Stolpe River flows into the outer hafen through the hafen narrows, which are about 65 yards in length with a width of 62 feet.

The inner hafen is formed by the banks of the river, which are lined with wooden quays, and is about 40 yards wide with a depth of from $14\frac{3}{4}$ to $16\frac{1}{2}$ feet. There are 1,790 yards of quay, 1,530 yards being furnished with railway lines, and there are landing stages on

both sides 165 yards long. The haven extends from the inner end of the narrows to the railway bridge.

Important notices to mariners are posted up at the pilot office.

The winter harbor, with a depth of 2 fathoms, is situated on the right bank, and separated from the river by a stone embankment; south of this harbor the river widens and forms a basin 206 yards long and 92 yards wide. Above the basin, near a wood yard, the river is crossed by a bridge, beyond which it is only accessible for boats.

Lights.—From an octagonal red tower, 70 feet high, at the southwest angle of the pilots' watchhouse, close to the inner end of the eastern mole, is shown an occulting white light 73 feet above the sea and visible 14 miles. From the middle of the entrance of the harbor the light bears 152° . (For details see Light List.)

At the east molehead a fixed red light is exhibited, and at the west molehead a fixed green light; the lights are shown from the molehead beacons, painted gray, at the respective elevations of 30 and 26 feet above the sea, and are visible 6 miles. These lights are unwatched.

Fog signal.—During thick or foggy weather, a siren, worked by electricity, situated at the outer end of the east mole, is sounded. Should the siren be disabled, signals, as far as possible of the same character, will be made with a hand foghorn. (See Light List.)

Water level.—With heavy gales from north to northeast the water may rise 4 feet above, and with southwest gales may fall 5 feet below, mean level, but such large variations are unusual.

Ice.—The entrance to the Stolpe is accessible as long as it is not closed by drift ice carried onto the coast by onshore winds, but which seldom happens. The inner haven freezes over only when the sea is very smooth, but the swell sent in by onshore winds breaks up the ice, which drifts out with the current.

Current.—The current sets across the entrance to the Hafen of Stolpmünde to the westward with winds from north, through east, to south-southeast, and to the eastward with winds from north, through west, to south-southwest; with gales blowing parallel to the coast the velocity may reach 2 knots. With winds between south-southwest and south-southeast the river current is noticeable. In spring the current of the Stolpe River may reach a velocity of 3 to 4 knots.

Signals.—International code signals are made at the pilot signal mast.

A red pendant at the pilot signal masthead signifies that the haven entrance is clear.

Danger signals for fishermen are shown as at Kolberg. These signals are not visible far on account of the dark background.

Wind and tide signals are made as at Kolberg.

Storm signals are shown here by day from a mast northeastward of the pilot watch house, at which house the weather reports are kept.

Life-saving.—There is a lifeboat and rocket station on the western side of the haven at Stolpmünde.

Road.—The best anchorage to take up in the daytime is with Stolpmünde Church spire bearing 156° and Schönwalde High Bank 71° , in 7 or 8 fathoms; at night in 8 or 9 fathoms, with Stolpmünde Hafen Light 156° and Scholpin Light 66° .

Pilots.—Pilotage is compulsory for all merchant vessels over 60 cubic meters' capacity. Entering without a pilot will be punished. The pilots meet vessels in the road in a rowboat in fine weather and in a sailboat in bad weather. The pilot boats are white and carry the pilot flag. Pilotage is included in the harbor dues, and assistance given by the pilot in warping, etc., is charged for.

Signal beacon.—The signal beacon stands on the East Mole near the pilot signal mast, and is used in the manner described for Kolberg, but when in use it carries a red flag instead of a ball.

Directions.—Those approaching from the eastward will easily make out the harbor by Scholpin Lighthouse on a high dune, by a remarkable hill named Revekol, 377 feet high, which lies 13 miles eastward of the port, and the high wooded shore at Schönwalde, while Jersthöft Lighthouse, lying 11 miles westward, will serve as a landmark from that direction.

As the depths before and in the entrance are subject to exceptional changes, no fixed leading mark can be given. Entering the haven without a pilot is therefore dangerous, and, moreover, is punished.

When entering or leaving, Stolpmünde church tower in line with the tower of the pilot watch house, bearing 154° 13, can be used for checking the compass.

In heavy gales between west-southwest and east-northeast, through north, the entrance to the haven should not be attempted on account of the high sea, heavy breakers, and narrow entrance.

If the weather be so stormy that it is dangerous for vessels to enter the harbor, neither the entrance pendant nor the signals indicating the depth of water nor the red signal beacon flag will be exhibited.

At night the entrance is not very difficult in fine weather, but no lookout is kept by the pilots during the night.

Stolpmünde, a village with about 2,800 inhabitants (1911) lies on the eastern side of the entrance to the Stolpe River and is the seaport of Stolp, a town about $9\frac{1}{2}$ miles southeastward, with a population of 33,768 (1911).

Stolpmünde has communication by a branch railway with Stolp and with the Stettin-Danzig Line. There is steamboat communication with Stettin.

Coal.—About 220 tons of coal are in store at the haven.

Water.—Good drinking water can be had, free of charge, from a Government fountain on the east side, opposite the royal timber yard; a hose can be obtained from the harbor board of works.

Trade.—The imports are chalk, lime, artificial manure, grain, timber, saltpeter, sulphur, granite, and paving stones; exports are grain, spirits, potato flour, glass, flour, fish, and wood.

Repairs.—Large castings and parts of engines can be made at the foundry of F. W. Pluentsch at Stolp. There is a slip (not patent) where vessels 131 feet long by 26 feet beam and 7½ feet draft can be hauled up. Divers can be had by arrangement with the harbor board of works.

Cranes.—The harbor board of works have a 2-ton crane. A floating crane, with hand power, to lift 12½ tons, is sometimes stationed at Stolpmünde, but generally at Rügenwaldermünde.

Stolpe Bank, situated 16 miles northward of Stolpmünde, is about 24 miles long east and west and 10 miles broad. It has on the greater part of it general depths of 5½ to 10 fathoms, sand; the shoalest part is the northwestern, where there are several patches with from 4½ to 5 fathoms water, and at the western end, where there is a depth of 5½ fathoms. On the southeastern edge of the bank the water deepens suddenly to 16 and 18 fathoms and on the other edges gradually.

A white light and whistle buoy, marked "Stolpe Bank N.," surmounted by two red triangles, points upward, and showing a flashing white light every 15 seconds, thus: Flash, 4 seconds; eclipse, 11 seconds, is moored in about 11 fathoms of water on the northern side of the bank north-northeastward of the northernmost shoal spot. The buoy is removed in winter when ice is expected. (See Caution re Oder Bank Buoys previously mentioned.)

Coast.—Between Stolpmünde and Rowe, a fishing village situated at the entrance of Lupow River, nearly 8½ miles east-northeastward of it, the land is tolerably high, and abreast Schönwalde, 2 miles southwestward of Rowe, the hills are precipitous and covered with forest. Lupow River flows through the Garder See, which is separated from the Baltic by a narrow ridge of bare sand hills.

Life-saving.—A lifeboat and rocket apparatus are stationed at Rowe.

Rowe Bank.—About ¾ mile northward of Rowe there is a shoal composed of gravel, nearly ¾ mile long east and west and ¼ mile broad, with depths of 2½ to 3 fathoms upon it and of 4 to 5 fathoms close around, the least water being on the west end of the bank; between this shoal and the shore the depths decrease gradually.

Wreck.—The wreck of the steamer *Rhein* lies sunk on the edge of Rowe Bank. The wreck has a least depth (1916) of 7 feet over it. A green wreck buoy is moored about 110 yards from the wreck.

Revekol Hill, 377 feet high, is the northernmost and highest of a densely wooded range of hills on the eastern side of Garder See. This hill forms a good landmark and can be seen in clear weather from Stolpe Bank.

Scholpin Light, named after Scholpin Village, $1\frac{1}{2}$ miles southwestward of it, stands about $\frac{1}{2}$ mile from the shore on the highest of the bare dunes, named Little Woolsack (Kleine Wollsäcke), between Garder See and Leba See.

The lighthouse, a black circular tower with black dome, is 83 feet high, from which is exhibited 246 feet above the sea a group occulting white light, visible 22 miles. A flagstaff stands a short distance westward of the lighthouse. (For details see Light List.)

Life-saving.—A lifeboat and rocket apparatus are stationed near Scholpin Lighthouse.

Leba.—From Scholpin a narrow ridge of barren sandhills extends 11 miles along the coast in an easterly direction, and separates Leba See from the Baltic. Between Leba See and Sarbsker See, $1\frac{1}{2}$ miles eastward of it, stands the small fishing town Leba, with about 2,000 inhabitants, which can only be seen from seaward when abreast the broad gap formed by Leba River, the outlet of Leba See.

The mouth of the river is inclosed by two parallel moles 82 feet apart, formed of pilework filled in with stones. The west mole is 33 yards shorter than the eastern, and between the moleheads is an oblique opening 44 yards wide. A sand bank makes out from the westward toward the east mole and forces the outgoing current toward it. The depth in the entrance is very changeable, varying from $3\frac{1}{2}$ to $6\frac{1}{2}$ feet, the least depth being in summer. The depth on the Breitlings Riff, off the entrance, is often barely $6\frac{1}{2}$ feet, and the breakers on it and on the west haken in a rough sea are dangerous for fishing boats entering.

Beacons.—On the East Molehead is a beacon 27 feet in height, consisting of a wooden post painted black and white in vertical stripes, surmounted by a red iron cage.

On the western side of the Leba entrance stands a beacon to mark the boundary of a fish preserve.

Lights.—Two fixed white range lights are shown which mark the eastern edge of the shoal extending from the western side of the entrance. The front light, elevated 18 feet, is on the east mole 250 yards from the outer end, and is shown from a mast 20 feet high; the rear light, 65 yards 170° from the front light, is elevated 22 feet, and shown from a mast 24 feet high. The position of the front light is altered to meet the changes in the bank mentioned.

A fixed red light, elevated 26 feet above the sea and visible 6 miles, is shown from the beacon on the east molehead. (For sectors see Light List.)

Fog signal.—In thick and foggy weather a fog bell is sounded in the daytime. Not sounded at night. (See Light List.)

Signals.—Danger signals for fishermen are shown as at Kolberg.

Wind signals are shown as at Kolberg.

Storm signals, both day and night, are shown from a signal mast southward of the harbor works office, where the weather reports are kept.

Life-saving.—A lifeboat and rocket apparatus are stationed on the east bank of Leba River.

Directions.—Approach the entrance on the line of the range light masts, but before passing the east molehead keep to the eastward of that line, and afterwards in mid-channel between the moles; the range lights in line mark the eastern edge of the shoal extending from the western side of the entrance and do not always lead eastward of the west molehead. There are no pilots.

Coast.—From Leba the shore gradually rises toward Rixhöft; barren dunes, named Great Woolsack (*Grosse Wollsäcke*), extend nearly 10 miles eastward of Leba. About $7\frac{1}{2}$ miles eastward of Stilo Lighthouse there is a conspicuous bare dune named Wittenberg, between which and Rixhöft lie Wierzchucin Moor, Zarnowitzer See, Zarnowitz Village, and its large church with two towers, Krockowsche Bruch, Karwen Bruch, and the Great Turf Moor. At Rixhöft the coast bends southeastward to Grossendorf, 4 miles distant, and thence in the same direction, forming the Hela Peninsula.

Stilo—Light.—A group flashing white electric light, elevated 246 feet above the sea, and visible 22 miles, is exhibited from a red, white, and black pyramidal iron tower, 110 feet in height, situated on the barren dunes, named Great Woolsack (*Grosse Wollsäcke*), about 1,100 yards from the beach. (For details see Light List.)

Fog signal.—A fog trumpet, worked by compressed air is established in a white circular iron tower, 60 feet high, on the coast northward of the lighthouse.

Storm signals are shown by day from a signal mast, with yard, westward of Stilo Lighthouse.

Wind signals, as a warning to fishermen, are shown from the same mast:

One red flag indicates a force of wind of 6 or over at Arkona. Two red flags indicate a force of wind of 6 or over at Brüster Ort. One red pendant indicates a force of wind of 6 or over at Arkona and Brüster Ort.

These signals are lowered when a storm signal is hoisted, or when the force of the wind at the two places named is less than 6.

Life-saving.—Koppalin Life-saving Station, situated about $3\frac{1}{2}$ miles east-northeastward of Stilo Lighthouse, has a lifeboat and rocket apparatus. Koppalin Village is nearly $1\frac{1}{2}$ miles southward.

A lifeboat and rocket apparatus are stationed near the beach at Karwenbruch, about 6 miles westward of Rixhöft Lighthouse.

Surveying beacon.—A framework beacon, about 100 feet in height and about 250 feet above the sea, stands on the high dune about 1,200 yards westward of Wittenberg Village and $7\frac{1}{2}$ miles eastward of Stilo Lighthouse. It will be replaced later by a permanent trigonometrical mark.

Storm signals, day and night, are shown at Karwen, $4\frac{1}{2}$ miles westward of Rixhöft.

Rixhöft, the northernmost point of Pomerania, is a precipitous headland, and may easily be recognized by its lighthouse and a yellow octagonal tower (a former lighthouse), standing 213 yards, 283° , from the lighthouse, the lower part not visible from sea, and the mill between them and Tupadel.

Light.—A flashing white electric light, elevated 247 feet above the sea, and visible 22 miles, is exhibited from a white conical tower with green lantern, 81 feet in height, situated on Rixhöft. (For details see Light List.)

Fog signal.—Near the lighthouse, during thick and foggy weather, a fog siren is sounded.

Wreck.—The wreck of a steamer lies sunk about 3 miles north-northwestward of Rixhöft Lighthouse. A green buoy with a "North" topmark is moored (1916) about 55 yards northward of the wreck.

Signal station.—Vessels may communicate with Rixhöft Station by the international code of signals (from sunrise to dusk), and messages will be forwarded by telegraph.

Telegrams are also dealt with for vessels passing, as soon as the latter come within signaling distance.

Telegrams for vessels must be expressed in the German language, or by a signal in the international code, and the distinguishing number and nationality of the vessel must be given in addition to the message.

An extra charge of 80 pfennigs ($9\frac{1}{2}$ d.) will be made, in addition to the ordinary tariff, for telegrams sent in this manner. The expenses due from ships at sea are charged to the receivers.

Ships exhibiting their distinguishing signal in passing are reported to their owners only when requested by signal or by the owners, the extra charge of 80 pfennigs being made in addition to ordinary tariff.

The application of owners should be addressed to District Office I, at Neufahrwasser.

Ice signals are made at Rixhöft.

Surveying beacon.—A framework beacon, about 100 feet in height and about 300 feet above the sea, is erected about 1.2 miles 146° from Rixhöft Lighthouse on the south end of a hill 220 feet

high. The beacon will eventually be replaced by a permanent trigonometrical mark.

This beacon, being higher than Rixhöft Lighthouse, will obscure Rixhöft Light in Putziger Wiek when it is in line with it.

Storm signals are shown by day from an iron latticework mast on a steep coast northward of the village of Chlapau, southeastward of Rixhöft.

Local magnetic disturbance.—An area in which the magnetic conditions are disturbed exists around Rixhöft.

Anchorage.—Vessels seeking shelter during southwesterly winds on the eastern side of Rixhöft will find good anchorage in about $4\frac{1}{2}$ fathoms, firm sand, about $\frac{1}{2}$ mile from the shore eastward of Chlapau Village, at $2\frac{1}{2}$ miles southeastward of Rixhöft Lighthouse; with northwesterly winds a heavy swell sets into this anchorage.

Danziger Bucht.—Between Rixhöft and Brüster Ort, 58 miles 82° from it, is the Danziger Bucht, about 33 miles in depth from north to south; in the entrance of the bucht there are depths of 50 to 60 fathoms, soft gray clay, decreasing gradually toward the shores, within a few mile of which the bottom consists of sand and clay mixed with sand. Abreast Rixhöft, about 600 yards from the shore, there is a depth of 5 fathoms, within which distance the water shoals suddenly.

The bucht is clear of danger outside the 5-fathom curve; within that line shoals are found in Putziger Wiek, off the mouths of the Weichsel River at Neufähr and Schiewenhorst and off the coast between Saltnicken and Brüster Ort, where they extend nearly out to the 10-fathom curve.

Off Neufährwasser and Pillau the alluvial deposit from the Weichsel and the Frische Haff has extended the 10-fathom curve to distances of $5\frac{1}{4}$ and $3\frac{1}{2}$ miles, respectively, from the shore.

On the western side, the Hela Peninsula extends southeastward far into the bucht. From the root of the peninsula, the coast southward to Oxhöft is bare and tolerably steep. From Oxhöft a partially wooded range of hills extends to Danzig, being fronted by a flat stretch of coast between Zoppot and Danzig. Between Danzig and Pillau the coast is formed of dunes with pine woods, especially in the western part; the eastern part of this stretch of coast forms the Frische Nehrung, which fronts the Frische Haff, and is 30 miles long and not more than 1 mile broad. The high land on the southern side of the haff is visible far seaward over the Nehrung. From Pillau to Brüster Ort the coast rises gradually to the rugged slopes of Samland.

Landmarks.—The churches of Putziger-Heisternest, and Hela with spire; the light watch house, situated $1\frac{1}{4}$ miles northwestward of Heisternest Lighthouse; Hela Lighthouse and the Kurhaus with a

round tower; the chimney of the sawmill near Putzig and a conspicuous tree near Rewa; the churches of Schwarzaue with spire, Putzig with tower, Oxhöft and Danzig; Rutzau Schloss with tower; the church steeple and buildings of Zoppot; the villa Hochwasser with tower; Karlsberg Tower; the church steeple of Langfuhr; the church with a double tower, tall factory chimneys, a square white warehouse with arched roof, and a large red granary at Neufahrwasser; the tower at Weichselmünde; the storm signal mast on the Quell Berg near Neufähr; Bohnsack Church, eastward of Neufähr; the wind semaphore at Schiewenhorst; the life-saving station at Neukrug; the landmark near Pillau; the buildings at Tenkitten; German Church; the Grosse and Kleiner Hausen Berg; the church steeple and mine chimney at Palmnicken and the buildings at Great Hubenicken (Grosse Hubnicken).

The churches at Langfuhr and Zoppot are only easily distinguished when in their vicinity, as they do not show up well against the wooded background.

Navigation.—In the western part of the Danziger Bucht, the shoals extending northward from the shore at Neufähr and Schiewenhorst should be avoided; also the Weichselriff, lying farther westward, may be dangerous for large ships in a heavy sea. Between Schiewenhorst and Palmnicken, vessels of deep draft can approach the shore to a distance of 1 mile; from Palmnicken to Brüster Ort the shore must not be approached within 3 miles. A vessel is north-westward of the Palmnicken and Kreislacken Shoals as soon as Brüster Ort Lighthouse bears 67° .

Fishery.—A brisk fishery is carried on in the Danziger Bucht from spring to autumn, with nets and lines, and extends far from land. Nets extend for a distance of 12 miles off the land in a 28° direction, commencing from a position 2 miles north-northeastward of the Fedder Ort Whistle Buoy, and salmon hooks are laid from 3 to 20 miles from the land in the space between lines drawn east-northeastward from Hela Lighthouse and north-northeastward from Heisterneest Lighthouse.

Hela Peninsula is low, sandy, and extends 18 miles in a south-eastern direction from the shore abreast Grossendorf Village; the northwestern part of this peninsula is about 320 yards across, increasing in width to $1\frac{1}{2}$ miles toward its southeastern extremity, which is covered with forest, and terminates in Hela Point, the eastern entrance point of Putziger Wick.

On the northern side of the peninsula the bottom is fairly steep the 5-fathom curve running nearly parallel with the shore from 900 to 1,000 yards distant, approaching closer on the southeastern side and to less than 400 yards off the southern point, where also the 10 and 20 fathom curve lie close together near the shore. The shoal

water on the sea side of the peninsula is narrow, the bottom being hard sand; sailing vessels in northerly and northeasterly winds should not approach near the shore to avoid stranding.

Storm signals are shown by day and night from an iron lattice-work signal mast at the village of Ceynowa, about $7\frac{1}{2}$ miles south-eastward of Rixhöft Light; also at Putziger-Heisternest, $6\frac{1}{2}$ miles farther southeastward.

An auxiliary station has been established at Kussfeld, between Ceynowa and Heisternest, for the use of the fishermen at that place, consisting of an iron mast with a movable arm and disk, which will be placed horizontal when a storm warning arrives.

Life-saving.—A lifeboat and rocket apparatus are stationed at Grossendorf, at the northwestern end of the Hela Peninsula; and there is a rocket station at Putziger-Heisternest.

Putziger-Heisternest, a village in about the middle of the peninsula, has a telegraph station.

Heisternest Light.—A group flashing white light, elevated 124 feet about the sea and visible 17 miles is exhibited from a white octagonal tower with dark-green lantern, 67 feet high, situated on a dune, 64 feet high on the Hela Peninsula. (For details see Light List.)

Whistle buoy.—A white whistle buoy, marked "Fedderort O.," with topmark of two triangles, bases together, lies nearly $\frac{1}{2}$ mile from the shore close to the 10-fathom curve 2 miles north-northeastward of Hela Lighthouse, and about halfway between it and Heisternest Lighthouse.

Light—Hela.—About 800 yards northeastward from Hela Point stands a white circular lighthouse 135 feet high, with dark-green lantern, from which is exhibited, 125 feet above the sea, a flashing white light visible 17 miles. (For details see Light List.)

Fog signal.—A siren, worked by compressed air, is situated 372 yards southeastward of the lighthouse. (See Light List.)

Putziger Wiek, on the western side of the Danziger Bucht, between the Hela Peninsula and the mainland, is bounded on the south by a line between Hela Point and Oxhöft. It is divided into two parts by a shoal with little water on it, and dry in some places, which extends north-northeastward from Rewa on the mainland to the Hela Peninsula. On the eastern side of the outer part of the wick the Hela Peninsula is fronted by Lange Haken and Heisternest Haken, shoals extending nearly 1 mile and 1.3 miles, respectively, from the shore, with deep water close-to. The depths in the entrance to the wick are from 10 to 30 fathoms, clay, and decrease gradually toward the mainland and toward the shoal extending across the wick, but very rapidly toward the shoals fronting the peninsula.

The depth in the inner part of the wick is from $2\frac{1}{4}$ to 3 fathoms in the channel leading to Putzig.

The shoal extending across the wick has a dredged channel through its southwestern part, 875 yards long and from 87 to 110 yards wide between the channel buoys, with least depth of $9\frac{1}{4}$ feet; the channel is named Putziger Deepke.

The western shore line of Putziger Wick is interrupted by the valley of the Plutnitz River and by the Brück Marshes. Oxhöft Spitze is steep toward the sea, with hardly any beach. Vessels of deep draft should not approach the point nearer than $\frac{3}{4}$ mile or into less than $6\frac{1}{2}$ fathoms, as the bottom is stony and uneven.

Putziger Wick affords excellent anchorage in all gales from seaward.

Shoal.—Neu Oblusch Shoal, of stones, with $2\frac{1}{4}$ fathoms on it, and $4\frac{1}{2}$ to 5 fathoms around, lies about 1,200 yards from the shore 2 miles northward of Oxhöft.

Buoys.—A white beacon buoy, with red topmark of two triangles, points downward, and marked "Hela S.," lies about 400 yards southwestward of Hela Point, on the reef that surrounds the point.

A white beacon buoy with red topmark of two triangles, points together, and marked "Alt Hela," marks the western edge of the shoal extending from Alt Hela, about 2 miles northwestward from Hela Lighthouse and 1,200 yards offshore.

A white beacon buoy with red topmark of two triangles, points together, and marked "Heisternest W.," is moored on the western side of Heisternest Haken $1\frac{1}{4}$ miles from the shore of the peninsula. The two last-named buoys are removed in winter.

A red and black beacon buoy with red ball as topmark, and marked "Deepke," lies on the western side of the wick in about 3 fathoms and marks the eastern approach to Putziger Deepke, the channel leading to Putzig. The northern side of the channel is marked by two red spar buoys marked "A" and "B," respectively, and the southern side by two black conical buoys marked "I" and "II." The Deepke Beacon Buoy is removed in winter.

Hela Hafen.—The fishing haven of Hela has an area of 10 acres, with a depth of $9\frac{1}{4}$ feet in its outer part. The entrance, 164 feet wide, is toward the south.

Hafen Lights.—At the western molehead of Hela Hafen a fixed light with white and red sectors, elevated 28 feet above the sea and visible 3 miles, is exhibited from a red iron stand 23 feet high. (For sectors see Light List.)

A fixed white light, elevated 12 feet above the sea and visible 2 miles, is shown from a red post 8 feet high on the pier near the assembly rooms at Hela.

Both these lights are unwatched.

Storm signals are shown at Hela; it is also a telegraph station.

Wind signals.—By a semaphore arrangement on the signal mast at Hela, passing vessels are informed as to the direction and force of the wind then existing at Brüste Ort and Rixhöft.

Wind direction.—At the sides of the lower part of the mast are two vertical circles, which as seen from the sea may be considered as representing two upright compasses, so that in each the top of it represents north, the right east, with the south at the bottom, and west on the left. A movable hand on the west circle indicates the wind direction at Rixhöft; another hand on the east circle indicates the wind direction at Brüste Ort.

Wind force.—At each side of the mast, below the yard, are four semaphore arms or wings which are placed horizontally to indicate the wind force. The arms at the west side of the mast show the wind force at Rixhöft; those at the east side the wind force at Brüste Ort.

The number of the horizontal arms on one side of the mast signifies double the number of the Beaufort wind force scale, as follows:

One arm signifies wind force 1 to 2; 2 arms signify wind force 3 to 4; 3 arms signify wind force 5 to 6; 4 arms signify wind force 7 to 12.

Wind forces over 7 are signaled by exhibiting the storm-signal ball at the side concerned, and all four of the wind-force arms.

For signaling calm, the indicator is pointed to south at the proper side of the semaphore, and all the wind force arms on that side are dropped.

The wind signals are readjusted on receipt of the telegrams transmitted from Rixhöft and Brüste Ort, every day at 7 a. m., noon, and 6 p. m., mid-European time (5 p. m. on Sundays and festivals), from April 1 to September 30. and at 8 a. m., noon, and 4 p. m. from October 1 to March 31. In addition to the regular telegrams, sudden important changes in the weather are made known, and the wind signals corrected.

Further details as to the state of the sea and weather appearances, are posted up at the schoolhouse at the inner end of the west mole of the fishing haven.

If the weather telegram is delayed, a semaphore arm at an angle of 45° upward will be exhibited on the appropriate side of the mast.

NOTE.—Half an hour before the regular report is due upon which changes of wind signals are made the uppermost arm is raised to an angle of 45°, while the other arms and the indicator will be lowered on the disks, to prevent the confusing of the signals. The arms remain in position, however, if a special telegram is received about the time the periodical report should arrive.

Life-saving.—A lifeboat and rocket apparatus are stationed on the beach northeastward of Hela Lighthouse.

Putzig, a town with about 2,100 inhabitants, lies on the western side of the inner part of Putziger Wiek. It has railway communication with Krockow, Rheda, Neustadt, and with Danzig via Gdingen.

The haven is northward of the town, and is about 65 yards long by 44 yards wide, with a depth of $8\frac{1}{2}$ feet at the east sea wall. It is approached by a dredged and buoyed channel, 547 yards long and $7\frac{1}{2}$ feet deep. Storm-warning telegrams are posted up on a shed near the east sea wall. Water can be had from the town fountain.

Lights.—Two fixed green range lights, elevated 26 and 16 feet, respectively, and visible 2 miles, are shown from two wooden posts 19 and 12 feet high and 35 yards apart, situated on the quay. In line they bear 185° , and lead through the channel into the haven. Shown when navigation is open; unwatched.

Directions.—To approach the entrance to the Putziger Deepke, keep 2 miles from the Hela or Oxhöft side of the wick until the western side of the inner part by Putzig is made out, when bring Gnesdau Mill in line with the point by Rutzau bearing 316° , which will lead toward the Fairway Buoy of the deepke, and when the large farm buildings of Bresin are seen over the houses of Beka steer toward the channel which is buoyed. Local knowledge is necessary after this.

Oxhöft Village is situated on the southern part of the heights, where the shore is precipitous and terminates in Oxhöft Spitze. The church is small with a low wooden tower; it is, however, a good landmark owing to its high position and white appearance. Shoal water extends $\frac{1}{4}$ mile from the point, and a rocky reef with $1\frac{1}{2}$ fathoms on it continues $\frac{1}{2}$ mile southward.

Light.—On Oxhöft Spitze, 580 yards northeastward from the church, stands a red octagonal iron house, 35 feet in height, from which, 155 feet above the sea, is exhibited a group flashing white light, visible 8 miles. (For details see Light List.)

The lighthouse is difficult to make out, and the church is a far better mark. The storm-signal mast will indicate the approximate position of the lighthouse.

Anchorage.—Between Oxhöft Spitze and Gdingen Village, $1\frac{1}{2}$ miles southward of it, good anchorage may be obtained in a depth of 5 or 6 fathoms during offshore winds.

Storm signals are shown at Oxhöft by day and night; the mast stands southeastward of the lighthouse.

Rifle practice takes place occasionally seaward from near Oxhöft. The danger zone extends to nearly $2\frac{1}{4}$ miles seaward, where a steamer cruises to give warning.

The coast from Oxhöft Spitze trends, in a southerly direction, $3\frac{1}{2}$ miles to Redlauer Spitze, thence curving $5\frac{1}{2}$ miles southeastward to Neufahrwasser.

Gdingen—Light.—A landing pier, 300 feet long, extends from Gdingen, a village and watering place about 2 miles southward of Oxhöft. A fixed white unwatched light, elevated 17 feet and visible 1 mile, is shown from a wooden post 8 feet high at the end of the pier.

Adlershorst—Light.—A fixed white unwatched light, elevated 13 feet and visible 2 miles, is shown from a wooden post 8 feet high at the head of the landing pier for motor boats at Adlershorst, a village and sea-bathing place southward of Redlauer Spitze. There is a railway station at Klein Katz, about 1 mile distant.

Koliebken.—About 1 mile southwestward of Redlauer Spitze lies the village Koliebken; its yellow church steeple is almost hidden by trees. Abreast this village a rocky shoal extends 1,200 yards from the shore, with $2\frac{1}{4}$ fathoms water on its outer edge, which is steep-to.

Zoppot, situated partly on the hills about midway between Redlauer Spitze and Neufahrwasser, is the most frequented bathing place on this coast. It has a pier extending into $14\frac{3}{4}$ feet water, with bathing huts on both sides. Zoppot Church, with its pointed steeple, is conspicuous from the sea.

Zoppot has about 12,000 inhabitants and has railway connection with Danzig and the places to the northward. There is communication by steamer in the bathing season with the watering places in the Danziger Bucht.

Lights.—Two fixed white lights, elevated 22 feet, and visible 3 miles, are shown from white iron posts, 10 feet high, situated at the head of the landing pier; two fixed blue lights, elevated 10 feet and visible 1 mile are shown from white iron posts 4 feet high at the outer ends of two wharves. The blue lights are shown from June 1 to October 1.

During the time of the bathing traffic the casino, the garden, and the pier are lighted by electricity. These lights are visible about 12 miles off.

Storm signals are shown by day and night from a mast at the head of the pier.

Anchorage.—There are no outlying dangers between Zoppot and Neufahrwasser, and with offshore winds good anchorage may be obtained in a depth of about 5 fathoms, hard sand clay, about $1\frac{3}{4}$ or 2 miles from the shore.

Measured distance.—A distance of 9,114 feet ($1\frac{1}{2}$ miles) has been measured on the coast between Zoppot and Brösen. Its north-western end is marked by a beacon surmounted by a triangle over a diamond in line with the tower of the Villa Hochwasser; its south-eastern end by a beacon surmounted by a triangle over a diamond

in line with another beacon surmounted by two triangles. The direction of the measured distance is a line between Koliebken Church and the lighthouse on the east molehead at Neufahrwasser, or 132° – 312° .

Glettkau—Light.—Glettkau, a sea-bathing village about $1\frac{1}{2}$ miles southeastward of Zoppot Church, has a casino with red roof, on the beach, and a pier 420 feet long, at the outer end of which a fixed white light, elevated 18 feet and visible 2 miles, is shown from a white flagstaff 9 feet high. The beach is lighted with electric arc lamps during the bathing season.

Brösen—Light.—Brösen Village, a sea-bathing place, lying about $\frac{3}{4}$ mile westward of the entrance to Neufahrwasser, has a pier 492 feet long, at the head of which a fixed white electric light, elevated 28 feet and visible 3 miles, is shown from a white post 16 feet high. The casino and pier are electrically lighted during the season.

Weichsel Riff—Buoy.—Weichsel Riff, the northeastern extension of the shore reef, on the eastern side of the entrance to Neufahrwasser, has a depth of $2\frac{1}{4}$ to $3\frac{1}{4}$ fathoms, and is marked on its northern side by a white beacon buoy marked "Weichselriff N.," with top mark of 2 triangles, points upward. The buoy is removed in winter.

The shoal on the eastern side of the river entrance, as defined by the 5-fathom curve, is shown to have extended as a spit to the northward, there being now a depth of $4\frac{3}{4}$ fathoms, situated at a distance of 1.1 miles north-northeastward from the Neufahrwasser east molehead.

Neufahrwasser, the outer harbor of Danzig, is formed by a canal and basin at the western mouth of the River Weichsel or Vistula, which runs through a low plain, covered with sand hills and lagoons.

Current.—In Neufahrwasser Road, and before the hafen entrance, the current sets eastward with westerly and westward with easterly winds; its velocity is dependent on the force of the wind, and occasionally reaches 2 knots with winds from the westward. In fine weather the current out of the Weichsel at Schiewenhorst flows to the northwestward toward Oxhöft and along the bank across Putziger Wiek. Generally there is no current in the bight off Glettkau and Brösen. The greatest rate of the current in the Neufahrwasser Hafen Canal, flowing in or out, is 1 knot.

Ice.—Neufahrwasser Road and hafen entrance are generally kept clear of ice by westerly and southerly winds. With long-continued winds from north-northwest to southeast through east, accompanied by hard frost, the entrance and road may be blocked by ice, but it is very seldom impossible for a strong steamer to enter. The Weichsel between Neufahrwasser and Danzig freezes in severe winters, but a channel is kept open by the ice breaker.

Information respecting the ice conditions on the German coast is posted up at the pilot office; and also respecting the German coasts of the North sea and Baltic at the office of the Küstenbezirk I, at Olivaerstrasse 38.

Gunnery practice takes place occasionally, both by day and night, from the coast batteries near Neufahrwasser, the danger zone extending 8 miles from the land. During the firing a black flag is flown from the signal mast at the pilot house in Neufahrwasser, and a pilot steamer cruises off the firing ground to warn vessels. A black ball at the signal masthead indicates that the haven is closed on account of the firing; the entry and departure of vessels can then only take place in the intervals of firing and is regulated from the pilot office.

Beacons.—Stundenglas Beacon, shaped like an hourglass, white, wooden, and about 66 feet in height, stands eastward of the inner end of the east mole, and in line 147° with the high chimney of the distillery leads through the middle of the entrance channel, into the haven.

The following beacons mark the sides of the dredged channel over the bar:

1. A red and white striped pile beacon, 15 feet high, with black pointed top and a white crossbar as topmark, stands on the East Mole about 164 yards from its outer end.

2. A black, white, and red striped pile beacon, 39 feet high, with white triangle, apex upwards, as topmark, stands on the Westerplatte, about midway between the Kaiser Steg and the eastern side of the haven.

3. A beacon, similar to No. 1, stands on the West Molehead.

4. A beacon, similar to No. 2, but with white square topmark, stands on the Westerplatte, southwestward of No. 2 beacon.

Nos. 1 and 2 beacons in line mark the northeastern side, and Nos. 3 and 4 beacons in line the southwestern side of the dredged channel.

Buoys.—A red beacon buoy, with the name "Neufahrwasser" on it, and surmounted by two red globes, lies outside the entrance to the dredged channel to Neufahrwasser, on the line of the red channel buoys. The two starboard-hand buoys, entering, are red spar buoys, marked "A" and "B," respectively; and the port buoy, entering, is a black conical buoy.

Lights—From Neufahrwasser Tower, an octagonal brick tower, on white stone base, 90 feet high to dome and 121 feet to vane, is exhibited 98 feet above the sea, an occulting light with white and red sectors; the white light is visible 15 miles and the red light 11 miles. (For details, see Light List.)

East Mole.—From a white octagonal iron tower with a black lantern, 44 feet high, on the extremity of the east mole, a fixed red

light is exhibited, 44 feet above the sea, visible 7 miles. (For sector, see Light List.) Unwatched.

Fog signal.—At the East Mole Lighthouse in thick or foggy weather, a bell, worked by electricity, will be sounded.

West Mole.—A fixed green light, elevated 36 feet above the sea, is shown from a red iron framework 35 feet high, on the seaward end of the west mole, visible 5 miles. The light is unwatched. (For sector, see Light List.)

Range lights.—A fixed orange colored light is shown at an elevation of 76 feet above the sea from an arm of the Stundenglas beacon, situated 450 yards to the northeastward of the main light. Another fixed orange-colored light is shown, at an elevation of 46 feet, from a white iron lattice-work mast, 42 feet high, situated 250 yards, 327°, from the former light. These two lights in line, 147°, lead into the haven entrance, between the moles, and are visible 7 miles. Unwatched.

Electric lights.—The quays and basin of Neufahrwasser are illuminated by electric arc lights, some of which are visible 10 miles seaward.

A fixed blue light is shown on the dolphin off the north point of the Holm, an island between Neufahrwasser and Danzig.

Entrance—Depth.—The entrance to the Hafen of Neufahrwasser lies between a short western and a long eastern mole, built out in a north-northwest direction. The width between the moles at the entrance is about 60 yards. Outside the west molehead there is a bar, through which a channel has been dredged about 1,300 yards in length, with a bottom width of 109 yards, a surface width of 130 yards, and a depth of 27½ feet.

Road.—The best anchorage in southerly and westerly winds is in 5½ to 7 fathoms, with the lighthouse on the east molehead bearing from 151° to 185°, distant 2 to 3 miles. A shoal of 4½ fathoms exists in the approach to Neufahrwasser, 1½ miles, 16°, from the east molehead.

A good berth is in about 6 fathoms, with Karlsberg Tower and Gletkau Pier in line, and the lighthouse on the east molehead in line with the high tower of Marien Church in Danzig.

In gales from northwest and north-northwest vessels should anchor south-southeastward of Oxhöft Spitze, under the high land, and in gales from north and north-northeast in Putziger Wiek.

Neufahrwasser Hafen, part of the haven district of Danzig, is formed by the canal, 1,750 yards long, through which the Tode (Tote) Weichsel discharges into the Baltic. Close inside the entrance, the Freihafen branches off to the southwest. The canal is from 55 to 76 yards wide, with a depth of 24½ feet in the middle,

and is lined with wharves on both sides, those on the south side being furnished with railway lines. A steam ferry at the entrance to the Freihafen connects both banks.

The Freihafen is 656 yards long, 109 yards wide, and 26½ feet deep; its area is 13½ acres, and there are 3,000 feet of quayage, provided with modern arrangements for loading and discharging vessels. On both sides are railway lines in connection with the stations at Neufahrwasser and Danzig.

Cranes.—At the Freihafen there are fixed cranes of 25 and 4 tons; 1 steam traveling crane of 10 tons; electric traveling, 1 of 2½, and 2 of 1½ tons; there are also sheers to lift 12½ tons.

Tugs are available. Steamers requiring the assistance of steam tugs for entering Danzig Harbor at night must make a request for them well in advance.

Divers can be obtained.

Life saving.—Two lifeboats and a rocket apparatus are stationed on the projecting spit between the Freihafen and the hafen canal, and 1 boat and rocket apparatus near the timber yard on the Westerplatte, northeastward of the customhouse.

Harbor signals.—The following signals are shown from the signal mast to the northward of the main lighthouse to indicate when vessels may enter or leave Neufahrwasser Harbor:

Day.	Night.	Signification.
One black ball over a semaphore arm placed at an angle of 45°.	Three red lights vertically placed.	Harbor closed, vessels cannot enter or leave.
One black ball.....	Two red lights over one green light vertically placed.	Harbor closed to incoming vessels.
A semaphore arm placed at an angle of 45°	Two green lights over one red light vertically placed.	Harbor closed to outgoing vessels.
A semaphore arm placed horizontal.	One red light between two green lights vertically placed.	Special caution is required to avoid collisions in harbor basin and channel.

A red flag by day, hoisted on the signal beacon on the inner end of the east mole in bad weather, or 3 green lights vertically placed on the signal mast by night, indicate that, although the harbor is open, bad weather prevents the pilot from boarding until the vessel is within the moleheads.

At the above signal mast international code signals can be made.

Storm signals are shown day and night, from a signal mast standing 45 yards northward of the lighthouse.

To avoid confusion with the red harbor light, the night storm signal is screened toward the sea, and can therefore be seen only by vessels inside. Weather reports are at the pilot lookout on the Westerplatte and on the south bank of the hafen canal, at the corner of Schulstrasse.

Time signal.—At Neufahrwasser principal lighthouse a black ball is dropped twice daily, from a height of 124 feet above the water and 100 feet above the ground; drop $6\frac{1}{2}$ feet.

At 10 minutes before the signal the ball is raised halfway up, and at 3 minutes before the signal to its full height.

The ball is dropped at 0 h. 0 m. 0 s. standard mean time, or 23 h. 0 m. 0 s. Greenwich mean time, and again at 1 h. 0 m. 0 s. standard mean time, or noon Greenwich mean time.

Signals made in case of failure as at Swinemünde.

Signal beacon.—Vessels that are being piloted into the haven by the pilot steamer must pay attention to the signal beacon after they have passed the fairway buoy off the entrance. The beacon is near the inner end of the east mole and has a red flag. The arm of the beacon, with flag attached, is inclined to the side toward which the vessel should steer, and when it is placed upright the vessel should keep steady as she is going.

Pilots.—Pilotage is compulsory for all vessels except those belonging to the German Government and a few others. Pilots meet approaching vessels in the road in a steamboat in fine weather, but in a rough sea the pilot steamer tows the pilot boat out. There is a night pilot service in clear weather and when the force of the wind is not more than 5 to 6, but vessels that have the Neufahrwasser main light bearing northward of 242° can not be seen from the lookout.

If the pilot is unable to board the vessel on account of the high sea, the pilot steamer hoists a red flag instead of the pilot flag, or burns a flare at night, and leads the way into the harbor, when a pilot will come on board inside the moles.

In the case of a vessel going to sea in heavy weather, the pilot is discharged inside the moles, and the pilot steamer precedes the vessel as far as the fairway buoy.

In fog or thick weather the pilot steamer lies from $\frac{1}{4}$ to $\frac{1}{2}$ mile northward of the fairway buoy and gives 2 long blasts, with her steam whistle and siren together, every 5 minutes.

Pilotage from sea to Neufahrwasser, the Freidhafen, or the haven canal is free. If the vessel proceeds up the river as far as Legan, river pilotage is paid once; if the vessel proceeds beyond Legan or to Danzig, river pilotage must be paid twice. A charge according to the size of the vessel is made for each time of shifting berth.

Directions.—The Neufahrwasser Lighthouse and the tower at Weichselmünde will not be sighted until halfway between Hela and Neufahrwasser, and the landmarks at the latter place, previously mentioned, will all be seen to the westward of the towers of Danzig. The Strandhalle at Brösen, a castellated building with two corner

towers, forms an excellent landmark, and from Hela Point should be kept a little on the port bow in order to fetch the Fairway Buoy; the building is lighted by electricity, generally up to midnight, and in the bathing season the pier in front of it is lighted by arc lamps.

To enter Neufahrwasser Hafen bring the Stundenglas Beacon in line with the chimney of the spirit factory in the town and with Weichselmünde Tower, and steer in on that mark until between the two moles, when keep in mid-channel into the hafen.

In northerly gales it is dangerous to attempt the hafen on account of the heavy sea off the narrow entrance. If forced to enter without a pilot, steer in on the mark given above until the signals made by signal beacon are made out, when they must be carefully attended to. A pilot will meet the vessel at the inner end of the west mole, and lines must be ready for him, as well as hawsers to lay out, and an anchor clear for letting go.

Neufahrwasser, a town with about 11,000 inhabitants, is the suburb and outer port of Danzig. Baths and a casino are on the Westerplatte.

Communication.—Neufahrwasser has railway connection with Danzig and Zoppot, and by electric railway with Danzig, Langfuhr, and Brösen. There is regular steamer communication with Danzig and Hela, and in fine weather during summer with Zoppot, Pillau, and Königsberg. There is telegraphic communication.

Quarantine.—The quarantine station and sick quarters are on the point near the west mole.

Coal.—There are about 2,100 tons of coal in stock belonging to different firms.

Water is delivered alongside in boats by contractors, and pumped in. There are also 12 hydrants along the hafen canal, whence drinking water can be obtained on application to the authorities, but they are seldom used.

Deviation of the compass.—For adjusting compasses in the road under way, six beacons stand on the shore westward of the Freihafen; they consist of piles with white boards, and are marked with consecutive numbers from 80 to 85. The beacons in line with Marien Church Tower in Danzig bear as follows: The westernmost, marked 80, bears 173° ; the next, 81, bears 174° ; and so on to the easternmost, marked 85, which bears 178° .

There is a dolphin about 328 feet northwestward of the west mole-head for vessels to make fast to when swinging for adjustment of compasses; the depth around the dolphin within a radius of 148 feet varies from 13 to 24 feet. From the dolphin Hela Lighthouse bears 26° , distant $12\frac{1}{2}$ miles. Oxhöft Lighthouse, 337° , distant 9 miles, and Karlsberg Tower 269° , distant $3\frac{3}{4}$ miles.

Neufahrwasser to Danzig.—The channel for vessels to Danzig from Neufahrwasser is formed by the western branch of the Weichsel. About 1 mile above the Neufahrwasser Hafen Canal the stream divides and forms two branches, with an island between them, named the *Holm*, the western semicircular branch being the proper bed of the river; the eastern branch, named the *Kaiserhafen*, is tolerably straight, and both branches meet again opposite the mouth of the *Mottlau River*, which flows through Danzig.

The *Kaiserhafen* is dredged to an average depth of $24\frac{1}{2}$ feet, and is 104 yards wide in the northern and 202 yards in the southern part. On both sides are arrangements for loading and discharging, and in the southern part are dolphins for securing vessels. A railway crosses the *Kaiserhafen* to the *Holm* by means of a ferry.

The *Mottlau River* flowing through Danzig forms two islands, *Bleihof* and *Speicher*; the channel westward of these is called *Mottlau*, that eastward of *Speicher* Island is *Neue Mottlau*, and that eastward of *Bleihof* is named *Kiel* or *Zimmergraben*.

Depths.—From the *hafen canal* at Neufahrwasser to the mouth of the *Mottlau* the depth is $24\frac{1}{2}$ feet, to be increased to $29\frac{1}{2}$ feet up to the *Schichau Yard*; by the *Kaiserhafen* it is from 23 to 26 feet. In the *Mottlau* from the mouth to the railway station basin in Danzig the depth is 11 feet, and in that basin 9 to 11 feet; in the *Kiel* or *Zimmergraben* $8\frac{3}{4}$ feet, and in the *Neue Mottlau* $6\frac{1}{2}$ feet.

Pilots.—The pilotage of the river is performed by the river pilots stationed at Neufahrwasser and Danzig. Caution is necessary, as the width of the river channel is much contracted in places by rafts which lie on both banks.

Weichselmünde is a fishing village on the east bank of the *Todte* (*Tote*) *Weichsel*, just above Neufahrwasser; northeastward of the village is the white tower of *Weichselmünde Fort*, with a gray roof, visible from the sea.

Weichsel Railway Station on the west bank, opposite *Weichselmünde*, has a quay about 875 yards long, with railway lines laid on it. There is a fixed hand crane to lift $7\frac{1}{2}$ tons and a traveling steam crane to lift $1\frac{1}{2}$ tons.

Telegraph beacons.—Red and white ball beacons are erected on both banks of the *Weichsel* below *Weichselmünde* and below the *Imperial dockyard* and at the gas works on the bank of the *Mottlau* to mark the position of telegraph cables. Anchoring is prohibited within 110 yards on either side of the line of these beacons under a penalty of 60 marks.

Danzig, situated on both banks of the *Mottlau*, near its mouth on the left bank of the western branch of the *Weichsel* or *Vistula River*, $3\frac{1}{2}$ miles within the entrance, is strongly fortified, and contained 175,964 inhabitants in 1912.

Danzig is the capital of West Prussia and has an extensive trade, especially in wheat, which is conveyed down the Vistula from Poland and other corn-producing countries and shipped hence to all parts of Europe. It is a naval station with dockyard and contains gun and ammunition factories, iron foundries, sugar refineries, sawmills, ship-building yards, etc.

The Mottlau is crossed by three drawbridges, the width of the smallest opening being about 40 feet; the Neue Mottlau is also crossed by three similar bridges, the smallest opening being about 25 feet wide.

The customhouse is on the lower part of the eastern branch and the pilot office on the left bank of the western branch. The customhouse quay is 500 feet long.

Communication.—There is communication by steamer with Stettin, Flensburg, Lübeck, Kiel, Hamburg, London, Amsterdam, Rotterdam, Antwerp, Bristol, Leith, and Hull; there is also steamboat communication between Danzig, Neufahrwasser, and Elbing. Danzig is connected by branch lines with the Eastern Railway and the German system, and by the Pomeranian Railway with Neufahrwasser and Stettin.

The telegraph office is always open.

Radio station.—A radio station is installed in the post buildings at Danzig, which is open to public service from 6 a. m. to 12 p. m. Call letters K. A. Z.

Hospitals.—In the port of Danzig there are several sailors' homes, also hospitals, two of which receive seamen; there is a garrison hospital.

Docks and Patent slips. See Appendix I.

Repairs.—Ships for the German Navy are built in the Imperial Dockyard at Danzig, and repairs of all kinds can be effected. Crane lifts 50 tons. Divers can be obtained in exceptional cases.

At the private shipbuilding yards vessels of any size and kind can be built and repaired. Engines up to 1,000 indicated h. p. can be built and repaired; 50 tons of iron can be melted and run at one time; 60-inch cylinders can be cast and bored; masts can be made and boats built. Moderate repairs to machinery can be carried out.

At the Schichau Yard there are sheers to lift 100 tons; divers can be hired.

At the Klawitter Yard there are the following cranes: Floating, 60 tons; electric, 20 tons; and hand, 10 tons.

Tugs are available.

Coal.—In 1911 about 4,800 tons of English and Silesian coal were kept in stock by different firms. It is stored on shore and in lighters. There is a coal wharf, 550 feet long (only 270 with a quay), with

a depth of 23 feet alongside. The price of coal varies from 18s. to 25s. per ton; 550 tons can be loaded in 24 hours.

In summer the large German men-of-war coal out in the bay, from lighters, at an extra charge of 4s. per ton to the price inside.

Supplies.—Provisions are plentiful. Water is delivered alongside by water boat, and pumped in.

Trade.—The chief exports are grain, beet sugar, wood, molasses, oil, flour, bran, and spirits. The chief imports are coffee, rice, lard, wine, coal, iron, herrings, petroleum, and chemicals.

Inner channel.—An inner channel, from Danzig to the Frische Haff is formed by the Todte (Tote) Weichsel from the mouth of the Mottlau to Plehnendorfer Sluice, thence through the Danziger Weichsel to Einlage Sluice and farther through the Weichsel to Rothebude and the Weichsel-Haff Canal. The least depth in this channel is $6\frac{1}{2}$ feet, in the eastern part.

Coast.—From Neufahrwasser the coast line trends in a southeasterly direction 5 miles to Neufähr Village, on the western side of which the Weichsel has forced its way through the narrow sand ridge, and deposited at its entrance several banks, with a channel leading into the river, liable to silt and to alteration.

Bank.—In front of the mouth of the Weichsel, at Neufähr, a tongue-shaped sand bank extends about $1\frac{1}{2}$ miles in a northerly direction, with depths of less than 1 fathom in places. It is subject to change with on-shore gales and breaks on the shoal spots.

Buoys.—A red beacon buoy, with topmark consisting of a ball with cylindrical cage underneath it, and marked "Neufähr," is moored off the northern end of the bank. The position and number of the channel buoys are liable to change; at present there are four red spar buoys, marked "A" to "D," moored on the eastern side of the bank, and two black conical buoys, marked "1" and "2," respectively, on the east side of the channel.

All the buoys are removed in winter.

Neufähr—Light.—An unwatched fixed red fishing light, elevated 29 feet above the sea, and visible 4 miles, is shown from a red square iron framework tower, about 28 feet high, on the pierhead at Neufähr. (For sector see Light List.)

Östlich Neufähr is a fishing village on the east bank of the Weichsel, about $1\frac{1}{2}$ miles within the entrance.

Storm signals are shown from the Quell Berg, on the western side of the river, northwestward of Östlich Neufähr, near Neufähr.

Life-saving.—A lifeboat is stationed at Neufähr, on the east mole, near the entrance.

A lifeboat and rocket apparatus are stationed northeastward of Bohnsack.

Bohnsack is a fishing village on the right bank of the Weichsel, above Östlich Neufähr. The church has a high spire.

In the Weichsel, between Neufähr and Einlage there are sand banks with from $6\frac{1}{2}$ to 8 feet over them, which contract the channel.

Weichsel River.—The mouth of the Weichsel or Vistula River at Schiewenhorst, about 6 miles eastward of the Neufähr Entrance, is a cutting through the dunes, whereby the principal branch of the river has a new outlet.

On the east side of the mouth, a mole 328 yards long extends north-northeastward, with a continuation for 164 yards at mean water level. A beacon 23 feet high, surmounted by a red pyramid, stands on the molehead.

The width of the cutting, which is over $1\frac{3}{4}$ miles in length, is 492 yards at the seaward end. Outside the mouth a deposit of sand has formed which is level with the surface in places at mean water level. The 3-fathom curve, which before the opening of the cutting was about 600 yards from the shore, is now over $\frac{1}{2}$ mile from it. The position of the 5-fathom curve has not altered to any extent.

On the eastern side of the entrance a channel, 130 yards wide and 13 feet deep, has been dredged parallel to the mole; it begins at the depth of 3 fathoms outside and continues more than $\frac{1}{4}$ mile into the entrance; above this channel the depth is 8 feet.

The seaward entrance of the channel is marked for the fishermen by a red and a black buoy; the channel is subject to continual change, and no dependence can be placed on the buoys.

Connection with the Danziger Weichsel is made by means of a lock at Einlage, and at Danziger Haupt, about 4 miles above Einlage, there is a lock for the traffic through the Elbinger Weichsel to the Frische Haff, Elbing, and Königsberg. At Rothebude, nearly 1 mile southward of Danziger Haupt, the Weichsel-Haff Canal begins, and connects with the Frische Haff by the Danzig Channel.

Schiewenhorst and Nickelswalde are villages on the western and eastern banks of the Weichsel cutting; a steam ferry connects them, and there is railway communication with Danzig, Tiegenhof, and Stutthof.

Storm signals are shown, by day and night, from a mast on a high dune on the western side of the Weichsel entrance, northward of Schiewenhorst.

Wind signals are shown from the storm signal mast; they give the direction and force of the wind at Rixhöft and Brüster Ort, in the manner as described on page 418.

Pasewark Beacon.—A dark-brown wooden beacon, 59 feet in height, stands on the dunes about 3 miles eastward of the Schiewenhorst Entrance to the Weichsel, and forms a good landmark for this

part of the coast. Pasewark Village is southwestward of the beacon on the southern side of the wooden dunes; it has a railway station.

Life-saving.—A lifeboat and rocket apparatus are stationed about 1,200 yards westward from Pasewark Beacon, near the beach. A rocket apparatus is stationed on the beach near Steegen, a village 3 miles eastward of Pasewark and connected with it, Danzig, and Stutthof by railway.

Storm signals, day and night, are shown from a mast on the dune northward of Vogelsang Village at the root of the Frische Nehrung; also near Kahlberg Lighthouse, $6\frac{1}{4}$ miles eastward.

Kahlberg Light.—A flashing white light, elevated 157 feet above the sea and visible 18 miles, is exhibited from a red tower, lower part square, upper part circular, with gray lantern 76 feet high, situated on a dune northeastward of Kahlberg Village.

The keeper's red dwelling adjoins the lighthouse on the east side.

Measured distance.—For testing the speed of vessels of deep draft, four pairs of beacons are erected on the Frische Nehrung, southwestward and northeastward of Neukrug. The outer beacons are white, the rear beacons red, and the distance between each pair is 2 miles, thus marking a total distance of 6 miles.

The outer course, in a depth of about 32 fathoms, and about 5 miles from the shore, is marked by four red beacon buoys, numbered from "1" to "4," consecutively, beginning from the southwest.

The inner course, in about 13 fathoms and over $1\frac{1}{2}$ miles from the shore, is marked in its center part for the distance of 2 miles by two red beacon buoys, the southwestern being marked "5" and the northeastern "6."

The course on the measured distance is 54° , or 234° .

Another measured distance of 1 mile is marked by two pairs of beacons on the Frische Nehrung, about 1.7 miles southwestward of Pillau Lighthouse. It is for the use of torpedo boats, and the course lies in the direction of the southwest molehead in line with the lighthouse on the northeast molehead of Pillau Hafen.

Storm signals—Life-saving.—Storm signals, day and night, are shown at Neukrug, where there is also a rocket station.

Pillau Tief, or the Glatt, the outlet of the Frische Haff, is formed by the northern extreme of the Frische Nehrung and a sandy spit on which stands the town of Pillau; it begins at the Fairway Buoy of the See Gat, and extends southeastward for nearly 2 miles to the entrance of Pillau Outer Hafen.

The See Gat is a channel in Pillau Tief, outside the moles, $\frac{1}{2}$ mile long and 328 yards wide, with a least depth of $27\frac{3}{4}$ feet, which is maintained by dredging and the action of the current. The channel is buoyed on both sides.

The See Tief is that part of Pillau Tief between and within the two moles, which extend in a northwesterly direction, and connects the See Gat with the Frische Haff. A bank with less than 3 fathoms on it extends halfway across the channel from the southwest side, beginning about 700 yards within the south molehead. The See Tief is 1.1 miles long, from 175 to 437 yards wide in the channel, and 25½ feet deep, with good anchorage in hard sand. It is open, however, to the northwest, and strong winds between west and north cause an unpleasant swell in the passage.

Ice.—The entrance to Pillau very seldom freezes over, owing to the strong current. The hafen has its ice broken up daily by an ice breaker, and can be approached as long as fixed ice does not form in the Baltic. The outgoing current causes the heaviest ice drift in the Pillau Tief. In spring as soon as the haff ice is in motion it drifts out during three to four days, and great caution is then required when entering.

The Königsberg Sea Canal is kept open as far as possible by ice breakers. If it is no longer navigable, there is at least one ice breaker at Pillau for breaking up the ice there.

In the Frische Haff during the winter of 1909-10 the fairway to Königsberg was closed to steamers on 47 days and to Elbing on 13 days, while in the following winter this occurred on 63 and 46 days, respectively.

Water level.—The water may rise 3 feet above, and fall 3¼ feet below mean level. Gales from northeast, through east, to southwest cause low, and winds from the opposite direction high, water level, but heavy floods from the Weichsel through the Nogat Mouths and from the Pregel as well as the conditions in the Baltic have an important influence on it.

Current.—During gales from south-southwestward to west-northwestward the current runs to the northward along the Frische Nehrung, and uniting with the haff current setting out of Pillau Tief, sets at the rate of about 4 knots an hour at times. During strong winds from northwestward and north-northeastward the current sets to the southward.

The haff current is greatly influenced by the strength and direction of the wind; during spring, when floods in the haff are highest, the current generally runs out; occasionally the current changes several times during the day.

A red burgee on the southern side of the pilot watchtower indicates that the current is running out; the same burgee placed on the northern side, that the current is running in.

Gunnery practice is occasionally carried out from the forts at Pillau. During the practice a square red flag is hoisted at the pilot watchtower, and a steam pilot vessel will cruise in the offing to direct

the movements of incoming vessels. During the firing no vessels, excepting those of the Imperial German Navy and German mail steamers, are allowed to enter or leave the harbor.

Rifle practice is also carried out seaward on the northern side of Pillau. The danger zone extends upward of 2 miles from the shore, between the lookout tower, $1\frac{1}{4}$ miles northward of Pillau, and the men's baths. When firing is going on a yellow flag is hoisted on the dune northward of the coast batteries.

Landmark.—A red brick building, with three pointed summits and three window openings, stands on the Schwalbenberg, northeastward of Pillau. The top of wall above the center opening is surmounted by a knob and weather vane.

Beacons.—For the entrance into Pillau Tief three dark brown beacons stand northwestward of the lighthouse and in line lead through the See Gat. The east or highest beacon, that nearest the lighthouse, is 98 feet high and has a triangle surmounted by a horizontal cask, with cross above, as topmarks.

The middle beacon, about 160 yards seaward of the east beacon, is similar to it, but only 72 feet high, and without cross; farther seaward, in the same direction, is the signal beacon with a flagstaff 59 feet high. All the beacons can be lowered down, and when they are down the entrance of vessels from sea is prohibited except from urgent necessity.

Signal Beacon.—Vessels compelled to enter without a pilot must attend to the signals, which are made with a red flag on the arm of the beacon, and steer toward the side to which the flag is inclined, keeping a steady course when the arm of the beacon is upright.

Telegraph beacons are erected near the Signal Beacon and on the opposite side of the See Tief to mark the position of a telegraph cable. Vessels must not anchor in the vicinity.

Buoys.—A red beacon buoy, with ball topmark, marked Pillau, is moored off the entrance to the See Gat, as Fairway Buoy, with Pillau Lighthouse and the south molehead in line.

The See Gat is buoyed on both sides; the See Tief only on the starboard side entering.

Lights—Pillau.—A group occulting light with white and red sectors, visible 15 miles, is exhibited 96 feet above the sea from a white tower 98 feet high, with copper dome, situated in the southern part of the town of Pillau. (For details see Light List.)

Range lights.—To the northwestward of this principal light 2 fixed white range lights, elevated 46 and 24 feet and visible 5 miles, are shown from the middle beacon and signal beacon, respectively; both lights are unwatched and are discontinued when the channel is blocked, but if an obstruction offers little or no danger, the light at

the signal beacon is shown, and in line with the main Pillau Light serves as leading mark. (See Light List.)

North Mole.—From a red circular iron tower, 36 feet high, on the north molehead of Pillau Tief, a fixed red light is exhibited at an elevation of 45 feet above the sea, visible 10 miles. (For sector see Light List.) Unwatched.

South Mole.—A fixed green light, elevated 42 feet, and visible 7 miles, is shown from a green iron column on the outer end of Pillau South Mole. (For sector see Light List.)

Hafen.—On the northwest molehead of Pillau Outer Hafen, two fixed red lights, vertical, are exhibited at the elevation, respectively, of 32 and 28 feet above the sea, visible at the distance of 2 miles.

On the southeast molehead of the Vorhafen two fixed vertical lights with white and green sectors are exhibited at 32 and 28 feet, respectively, above the sea. (For sectors see Light List.)

On the southern angle of the town shore a small fixed green light is exhibited from a white mast at the height of 30 feet; white and red lights are shown in conjunction with the green light as signals for entering or leaving the Innen Hafen. See Hafen signals.

Pillau Rinne.—On the eastern coast of the end of the Frische Nehrung, lights are exhibited from two brown wooden pyramidal beacons, the southern with ball topmark, 95 yards apart. The northernmost or rear light is fixed white, elevated 42 feet above the sea; the southern or front light is occulting white, elevated 33 feet; these lights are visible 6 miles, and when in line lead from Frische Haff, through Pillau Rinne, toward the southern entrance of Pillau Tief. Shown as long as the haff is clear of ice. They are unwatched. (For details see Light List.)

Fog signal.—A foghorn, worked by compressed air, is sounded on the north molehead at Pillau. (See Light List.)

Pillau Hafen comprises Vorhafen, Innenhafen, Hinter, and Petroleum Hafens; also Holz and Bau Hafens.

The hafen extends in a northeasterly direction from the inner part of the See Tief, from which an entrance, 120 yards wide and 23 feet deep, leads into a roomy basin named the Vorhafen. The Vorhafen has depths of $3\frac{1}{4}$ to $4\frac{1}{4}$ fathoms, and is connected with the Königsberg Canal by a cutting through the Petroleum Hafen, 22 feet in depth.

The Petroleum Hafen lies outside and southward of the Vorhafen, has an entrance from the See Tief, and is connected with the Vorhafen by an opening which can be closed by an iron fireproof gate.

The Innen and Hinter Hafens extend canal-like in a northeasterly direction from the Vorhafen, between the town and Russian Dam Island, and are together over 1,600 yards long, with a width of 76

yards and a depth of 23 feet; there are about $1\frac{1}{4}$ miles of sea wall, with railway on the west side of the channel. On the railway station quay there is a 20-ton crane.

A branch canal, named the Graben, extends northwestward into the town for a distance of about 328 yards, with a width of 55 yards, and a depth of 23 feet; the coal stores are on its northeastern side.

At the northeastern end of the Hinter Hafen, at Alt Pillau Village, is a fishing haven; the Holz Hafen lies on the northeastern side of Russian Dam, and the Timber (Bau) Hafen on the southeastern side, with depths of from $1\frac{1}{2}$ to 3 fathoms, and an opening into the Vorhafen.

A telegraph cable is laid across the Innen Hafen about 109 yards behind the fiscal ferry, and anchorage in its vicinity is prohibited. Its position is marked by a tablet with the inscription, "Telegraph, nicht ankern," upon the Russian Dam.

Tugs are available; vessels requiring one hoist 2 flags, one over the other.

Hafen Signals, for regulating the traffic, are made at the southeast angle of the town, between the Vor and Innen Hafens from a signal mast, which carries a black ball by day and a green light at night. The day signals are made by movable double arms above and below the ball, and the night signals by two lanterns showing white or red lights, one above and one below the green light. While the mast is not in use at night only the green light is visible.

Entry into the Innen from the Vorhafen, and vice versa, is permitted:

(a) By day, when both signal arms above and below the ball on the signal mast hang down perpendicularly, so that only the black ball is seen. (b) At night, when the green light is shown between two white lights, vertical.

Entry into the Innen from the Vorhafen is prohibited:

(a) By day, when the signal arm above the black ball is horizontal. (b) At night, when the three vertical lights on the signal mast show, from above, red, green, white.

Exit from the Innen to the Vorhafen is prohibited:

(a) By day, when the signal arm below the black ball is horizontal. (b) At night, when the three vertical lights show, from above, white, green, red.

Entry into the Innen from the Vorhafen, and vice versa, is prohibited:

(a) By day, when both signal arms on the mast are horizontal. (b) At night, when the green light is shown between two red lights, vertical.

Caution is required when entering the Innen Hafen, and vessels should navigate at slow speed.

Signals for the traffic on the Königsberg Canal are made from the signal mast on the southwestern side of Russian Dam.

Current signals are made at the pilot watchtower.

Storm signals, day and night, are shown from the middle beacon and from the signal mast on the southwestern side of Russian Dam.

Wind signals, similar to those at Hela, are shown from a signal mast on the Nehrung, about 930 yards southwestward from Pillau Lighthouse; they give the direction and force of the wind at Rixhöft and Brüster Ort.

The daily weather telegrams are posted up on the west wall of the pilot house.

Pillau Road.—The outer road extends for a distance of 4 miles between southwest and northwest, from the fairway buoy of the See Gat. There is good anchorage with offshore winds in 9 or 10 fathoms, with Pillau Lighthouse bearing 110° , distant $3\frac{1}{4}$ miles, or with the lighthouse 113° and Lochstädt Castle seen just open of the northern edge of the wood (Waldkrag), about 4 miles northeastward of Pillau. Vessels only anchor in the See Tief to clear at the custom-house.

Pilots.—Pilotage is compulsory for foreign vessels except for those of not more than $9\frac{1}{4}$ feet draft or not more than 170 cubic meters capacity. Pilots are available at night. The pilot steamer remains at sea as long as the weather permits and carries the Prussian Pilot Flag. When the pilot is unable to board an approaching vessel on account of the weather, and the wind and sea allow such vessel to enter, a large square red flag is hoisted at the mizzen of the pilot vessel as a signal that she will lead the way and that the vessel entering should follow.

A red square flag at the pilot watchtower denotes that vessels can not be provided with pilots but will be guided by the signal beacon as long as entry is possible.

The station is provided with 4 chief, 18 sea, and 8 haff pilots. They keep a lookout from the watch tower, which stands near the See Tief, between the Middle and Signal Beacons, about 547 yards from Pillau Lighthouse.

No charge is made for pilotage from sea to Pillau.

Directions.—Approaching Pillau from the westward, the first land seen, according as the vessel is northward or southward of the port, is the hills northward of Pillau and the Lochstädter Wald or the Frische Nehrung. The land between Brüster Ort and Palmnicken appears as a high yellowish shore, while the detached plantations on the Nehrung, which is very low near Pillau, appear at first as islands. On a nearer approach the steep yellow shore of the Schwalbenberg, with the landmark on it and Pillau Lighthouse will be seen.

Steer 124° toward the lighthouse until the range beacons standing northwestward of it are made out, when they should be brought into line and steered for, which mark leads through the See Gat into the See Tief; the direction of the coast current must be considered, and that of the Haff current will be signaled from the pilot watch tower. If entering the hafen an anchor and hawsers must be ready. When inside the moles, leave the red buoys to starboard, keeping about 100 yards from the northern side, and enter the Vorhafen; or steer more southward to pass through the channel into the Haff. Before entering the Vorhafen the hafen signals should be attended to.

In heavy gales, with high sea and strong inflowing current, when there is great danger for vessels entering, the range beacons are lowered down as a signal that entry is not permitted; this occurs very seldom, however. If the pilot can not get away owing to bad weather, a red square flag is shown at the pilot watch tower, and the vessel either follows in the wake of the pilot steamer or steers by the signals from the Signal Beacon. The vessel should enter as fast as possible to overcome the coast current, and, when within the moles, reduce the speed to let the pilot come on board.

In gales from north to northwest a strong current sets mostly to the southward, therefore vessels entering should approach the See Gat from the northward so as not to be driven behind or on to the South Mole; when within the moleheads the helm must be attended to and head sail set if necessary to keep off the North Mole.

In gales from southwest, through northwest to north, vessels of deep draft are recommended to seek shelter under Hela Peninsula, or to keep at sea, as with these gales a very heavy sea and breakers are found in the See Gat, so that entry is impossible.

At night steer toward Pillau Light on a 124° bearing until the range lights are seen, when bring them into line and proceed as directed above, but foreign vessels are not permitted to enter without a pilot.

Pillau, a town and watering place with about 7,020 inhabitants (1912), lies at the entrance to the Frische Haff, at the southern end of a tongue of land about 5 miles long, and opposite the end of the Frische Nehrung. The inhabitants are engaged in fishing, the amber industry, and shipping trade.

Communication.—Pillau is connected by railway with Königsberg and has regular steamer communication with that place and Elbing. The telegraph office is always open.

Life-saving.—There are two life-saving stations, each with a lifeboat and rocket apparatus; one is near the middle beacon and the other on the Nehrung, about 600 yards southward of the inner end of the South Mole.

Hospital.—Seamen are received into the town hospital. There is also a garrison hospital.

Coal.—About 1,600 tons of English and Scotch coal are in store. There is a coal wharf 300 feet long, with 18 to 19 feet alongside.

Supplies.—Provisions are plentiful. Water can be obtained.

Repairs.—The shipbuilding yard of F. Schichau, at Elbing, undertakes repairs. Diving apparatus can be hired from the Royal Hafen Board of Works.

Floating docks, see Appendix I.

Trade.—The imports are chiefly coal, basic slag, stone, cement, lime, fertilizers, and fish; the exports, wood, flax, hemp, and grain.

Deviation.—A dolphin in the Hinter Hafen is used for swinging vessels; from it the ruined tower of Balga on the eastern side of the Frische Haff bears 158°.

And for use when the weather is not very clear Camstigall Point bears 112° and Pillau Lighthouse 224°.

Pillau to Königsberg.—From Pillau to Königsberg there are two channels, viz, the Königsberg Canal and the channel through the Königsberger Haff, as the northern part of the Frische Haff is called. Both channels end in the mouth of the Pregel.

Ice.—During winter the Königsberg Canal only is kept open, as far as possible by ice breakers. The ice in the haff disappears about 10 days after the navigation is open for sailing vessels.

Water level.—The highest level occurs as a rule once a year, except at the spring floods, and the lowest more frequently. The water rises with winds from west-southwest, through west to north-northeast, is stationary with those between south and west-southwest, and falls with winds from other directions. In the haff the water rises in the middle to 4 feet above, and falls to nearly 3 feet below mean level; in the Pregel the water rises to about 5½ feet above and falls to 4 feet below mean level.

Königsberg Canal, given over to public traffic on November 15, 1901, is 17½ miles long from Pillau to the mouth of the Pregel, 20½ feet deep, and has a bottom width in the inclosed portion of 33 yards, and in the entrance to Fischhausener Wiek, 82 yards. With the exception of the latter part, where the depth in 1911 was only 13 feet, the canal is separated from the Frische Haff by dams for nearly its whole length; this unembanked portion is being constantly dredged to a depth corresponding to that of the canal, or 20½ feet. The dams have generally a straight direction, except at the bends off Peyse, between Zimmerbude and Widitten, and off Nautzwinkel; they are formed of pile walls with stone filling. In the neighborhood of Pillau and on the stretch between Peyse and the east end the haff side of the dam is banked up and planted with rushes, willows, and reeds. There are openings in the dam 33 yards wide,

for fishing boats, abreast the villages on the north side of the haff. The axis of the canal in the straight stretches lies 79 yards from the dam, the distance being greater in the curves.

The Pregel, from its mouth to Königsberg, is about $4\frac{1}{2}$ miles long, with a least depth of $21\frac{1}{3}$ feet. There is a towing dam along the north bank for about $4\frac{1}{4}$ miles.

Pilots for the Königsberg Canal are stationed at Pillau and Königsberg. Pilotage is compulsory for vessels of 9 feet draft and over.

Vessels of all nations can navigate the canal, with the exception of foreign war vessels. The draft must not exceed $19\frac{1}{2}$ feet.

Lights.—The openings in the Königsberg Canal leading to Kamstigall, Zimmerbude, and Gross Heydekrug are lighted by leading lights at those places, shown when the haff is clear of ice. (See Light List.)

Canal lights.—Two fixed white lights, vertically 3 feet apart, are shown from a red beacon, 27 feet high, on the western end of the western dam, on the southern side of the Königsberg Canal. Beyond this the canal is regularly lighted. (For details see Light List.)

Beacons.—Two range beacons, 153 yards apart, are erected on the southern dam head off Kamstigall to mark the axis of the channel across the entrance to Fischhausener Wiek, in a 75° direction; the rear beacon has a triangular top mark, point downward, 46 feet above mean water level; the front beacon has a triangle, point upward, elevated 30 feet.

Buoys.—A red beacon buoy, marked "1," with cross topmark, lies before the canal entrance at Pillau; farther eastward, at the branch to the Vorhafen of Pillau, is a black and red beacon buoy with cross top mark. The canal, throughout its whole length, is marked by black conical buoys on the north and red spar buoys on the south side. The distance between the two lines of buoys in the inclosed portion of the canal is about 140 feet, and in Fischhausener Wiek 287 feet. The buoys are marked with numbers, beginning from Pillau, the black buoys with even, and the red buoys with odd, numbers. These buoys remain throughout the winter, except the 2 beacon buoys, which are replaced by red spar buoys.

The channel through Königsberg Haff runs from Pillau Tief through Pillau Rinne, which is $1\frac{3}{4}$ miles long, from 82 to 110 yards wide, and 12 feet deep. From the light buoy at the southeastern end of the latter channel, through the haff to the light buoy at the southwestern end of Königsberg Rinne, the distance is 8 miles, with a depth of 11 to 13 feet. The Königsberg Rinne is $8\frac{3}{4}$ miles long, 82 yards wide, and has a depth of $9\frac{1}{4}$ feet in places, and is decreasing, as the channel is no longer dredged.

Light buoys.—Pillau Rinne. A light buoy painted black and red in horizontal bands, showing a flashing white light every 4 seconds, thus—flash, $1\frac{1}{2}$ seconds; eclipse, $2\frac{1}{2}$ seconds—is moored in about $2\frac{1}{2}$ fathoms at the Frische Haff entrance to the Pillau Rinne.

Königsberg Rinne.—A light buoy painted black and red in horizontal bands, showing an occulting white light every 4 seconds, thus—light, $2\frac{1}{2}$ seconds; eclipse, $1\frac{1}{2}$ seconds—is moored in about 14 feet off the southeastern end of the Peyse Haken before the entrance to the Königsberg Rinne. These two buoys are replaced in winter by red spar buoys with cross broom top marks.

Buoys.—The Pillau Rinne, and Königsberg Rinne are buoyed.

White spar buoys, with top mark of two triangles, points downward, lie on the south side of Heerd Bank, Kamstigall Haken, and Peyse Haken; they are marked "H. S." "C. S.," and "P. S.," respectively.

Storm signals, day and night, are shown from a signal mast on the southern side of the Pregel Entrance.

Königsberg Hafen is formed by the Pregel, a combination of the Old and the New Pregel Rivers which unite within the city. Within the city there are about 2,300 yards length of wharves, of which nearly 1,600 yards are furnished with railway lines. Below the city is the railway station quay, with railway grounds and warehouses.

The depth from the mouth of the Pregel to the Hohe Bridge, and in the New Pregel from Hundegat to the ramparts is $21\frac{1}{2}$ feet; from the Hohe Bridge to the ramparts, and in the connecting branch between the Old and New Pregel, $14\frac{3}{4}$ feet.

The Old Pregel is crossed by four iron hydraulic lift bridges, with openings 40 and 41 feet in width (the Hohe Bridge being one), and a railway swing bridge worked by hand, with an opening of 38 feet. Over the New Pregel are three iron hydraulic lift bridges, two with openings of 74 feet and one of 52 feet. A similar bridge, with an opening 33 feet wide, crosses the branch connecting the two rivers.

Cranes.—There are two $7\frac{1}{2}$ -ton cranes available for shipping goods, one belonging to the Eastern Railway, and the other to the municipal council; a 25-ton hand crane and a 3-ton electric traveling crane belong to the Customs; there are also four other electric traveling cranes, one of 3 tons and three of $1\frac{3}{4}$ tons, on the quay, in front of the Werfthalle.

Pilots.—Pilotage is compulsory; for exception, see Pillau. There are nine haff pilots who conduct vessels through the Königsberg Canal and the haff, and shift vessels in the hafen. The pilot is to be given free messing and a place to sleep on board the vessel to be piloted.

Königsberg, the capital of the Province of East Prussia, with 259,122 inhabitants (1912), lies on both sides of the Pregel, about $4\frac{1}{2}$

miles from its mouth, and about 22 miles from Pillau. The principal industries are ironworks, amber, brewing, wood and wood pulp, and corn export.

Communication.—There is railway communication with the chief towns in the interior and as far as the Russian frontier; with Pillau and Palmnicken and the watering places of Kranz, Neukuhren, Rauschen, and Warnicken, and to Schaaksvitte on the Kurische Haff. There is regular steamer communication with Memel, Tilsit, Elbing, Danzig by the inner channel, and Pillau; also with Stettin, Lübeck, Hamburg, and Kiel, but the departure for the last four places does not take place on particular days. The telegraph office is always open.

Repairs.—The Union engine-building establishment and iron foundry undertake repairs to vessels. There are sheers to lift 25 tons, worked by hand. Small repairs to vessels can be effected at the shipbuilding yard of G. Fechter, where there is a slip for small river craft.

There are no professional divers, but the city fire brigade has a diving apparatus, which can be hired.

Hospitals.—Seamen are received into the city hospitals. There is a garrison hospital.

Coal.—About 17,000 tons of coal, mostly Scotch, are in stock (1911), belonging to different firms in the immediate neighborhood of the hafen. It is brought alongside in wagons or lighters and put on board in baskets.

Supplies.—Provisions are plentiful, also lubricating oils. Water can be obtained on the wharf from the town supply; it should not be taken from the river for drinking.

Trade.—The principal imports are coal, coke, phosphate, herrings, ironware, machinery, sugar, petroleum, etc. The exports are chiefly grain, hemp, flax, tow, oil cake, wood, etc.

Inland channel.—A channel about 40 miles in length, with a least depth of 4½ feet at mean level, connects the Frische and Kurische Haffs by means of the Pregel and Deime Rivers, passing by Tapiau and Labiau. Small coasters in ballast, going to Memel to load, often use this route.

Frische Haff, which is separated from the Danziger Bucht by the Frische Nehrung, is about 50 miles long northeast and southwest, with an average width of 5 miles. In the southwestern part, named the Elbinger Haff, the Weichsel River empties itself by the Nogat mouths, and in the northeastern part, named the Königsberger Haff, lies the entrance to Pregel River, which flows through the town of Königsberg.

The general depths in Frische Haff are 1½ to 2½ fathoms, the deepest part being southeastward of Pillau, between Kamstigall and

Kahlolz, where there is a depth of $2\frac{3}{4}$ fathoms in the middle; the bottom in nearly every part consists of soft clay and gray mud mixed with sand. The shores of the haff are surrounded by a hard bank underlying the soft bottom, and having a breadth of 1,200 to 1,600 yards, with depths of 3 to 6 feet of water. In some parts of the haff, banks of hard sand and shingle extend some distance from the beach; and in other parts, where the shore consists of meadowland or soil deposited by the rivers, reeds and rushes extend some distance into the haff. The shore on the eastern side is well cultivated, and the land rises inland, the hills approaching close to the haff in parts. The northern shore is well wooded.

The canal and channel through the haff to Königsberg have been described.

Ice.—The Elbinger Haff is generally clear of ice 8 days earlier than the Königsberger Haff, it being drifted out to sea by the current from the Weichsel, which is stronger than that in the Königsberger Haff, where the ice melts more slowly. There is heavy ice drift in the haff as soon as the upper waters of the Weichsel flow through the Nogat Mouths.

In the northern part of the haff ice was present for $112\frac{3}{4}$ days on the average, for eight winters, 1903-4 to 1910-11; maximum 153 days in 1908-9, minimum 91 days in 1909-10.

Water level.—The water level in the Frische Haff is dependent on the direction of the wind; consequently the depths in the channels fluctuate considerably.

Buoys.—The projecting shoals in the haff are marked by white spar buoys, with topmarks according to their position. The entrances to the small hafens are marked by beacon and channel buoys; the dredged channels by perches and pricken.

Elbing—Depths.—From the Frische Haff to the West Molehead, the dredged channel is $6\frac{1}{2}$ miles long, 57 yards wide, and $10\frac{1}{2}$ feet deep; thence to within $4\frac{1}{2}$ miles of the town the channel is 55 to 65 yards wide, with the same depth, and farther, up to the town, 44 to 55 yards wide and $9\frac{3}{4}$ feet deep.

Elbing Hafen, 55 yards wide between Speicher Island and the town has a depth of $9\frac{3}{4}$ to 13 feet. Both banks are lined with sea wall, and serve as berthing places; that on the right bank is about 820 yards, and on the left about 550 yards. The depth at the sea wall is $9\frac{3}{4}$ feet, and at the berthing place for small steamers only 5 feet. The hafen is crossed by two lift bridges, about 200 yards apart, with openings of 38 and 33 feet, respectively.

Vessels arriving lie alongside the new discharging and loading place in front of the customhouse.

Water level.—In the Elbing River, as in the Frische Haff, the water level is dependent on the direction of the wind. In northerly

winds the water may rise about 20 inches above, and with southerly winds fall about $3\frac{1}{2}$ feet below, mean level. The spring floods cause a high level for a long time.

The Elbing River freezes over no earlier than the haff and is quite free from ice drift.

Storm signals.—The storm signal station at Neu Terranova, on the west mole by the Elbing Hafen House, shows by day only the black ball and red flag; at night a red light.

Pilots.—A pilot employed by the merchants of Elbing takes vessels from that place to Pillau and Königsberg; the pilots of those places take vessels to Elbing, but if the Elbing pilot is present at either of them, he has the right to pilot a vessel to Elbing.

A tug is available.

Elbing, a town of 58,636 inhabitants (1912), is situated on the river of that name, about 6 miles from the Frische Haff. The chief industries are shipbuilding at the Schichau Dockyard, tobacco, leather, soap, and glass.

Communication.—Elbing is a station on the line from Berlin to Eydtkuhnen, and there is railway communication with other parts. There is regular steamer communication with Königsberg, Pillau, Danzig, Stettin, Kahlberg, in the Frische Haff, and Stutthof.

Repairs.—Large repairs to machinery can be carried out by the firm of F. Schichau, which owns a shipbuilding yard, steel and iron foundries, and engine factory; both engines and boilers for the largest vessels are made by this firm. At this establishment are two fixed cranes, one being electric, to lift 70 tons, and one steam, to lift 40 tons, besides three traveling steam cranes, one of 8 and the other of 6 tons, and a hand crane of 3 tons.

The customhouse has a hand crane of 3 tons and the railway one of 5 tons.

There is also another small building yard, where vessels can be repaired.

Floating docks.—See Appendix I.

Coal.—About 300 tons of Scotch and Silesian coal were in store in 1911. The coal store is on Speicher Island.

Water.—Drinking water can be obtained from the town supply.

Trade.—The chief imports are tobacco, iron, coal, coke, cement, grain, petroleum, paving stones, etc.; the chief exports enameled ware, boilers, engines, and wood.

Inland navigation.—From the upper Elbing small craft can reach Osterode and Deutsch-Eylau by means of the Oberländischer Canal. The craft must not exceed 80 feet in length, $9\frac{1}{4}$ feet beam, and $3\frac{1}{2}$ feet draft.

Harbor lights in Frische Haff.—Several villages and small towns with small harbors lie on the western and eastern sides of

the Frische Haff and also on the northern side; the town of Fischhausen lies at the head of Fischhausen Wiek, northward of the Königsberg Canal. (For lights and buoyage at these places see Light List.)

Storm signals in Frische Haff.—On the western side of the haff storm signals are shown at Vogelsang and at Neukrug.

On the eastern side day and night signals are shown on the north mole at Passarge and at Balga.

At Fischhausen the storm signal is a black ball only.

Life-saving.—On the western side of the haff a rocket apparatus is stationed at Pröbbernau and at Neukrug; also a lifeboat and rocket apparatus at Grossbruch.

The coast from Pillau extends in a northerly direction 20 miles to Brüster Ort. Near Pillau it consists of sandy heights, fronted by trees along the shore; about $1\frac{3}{4}$ miles northeastward of the entrance to Pillau is a lookout tower, and about 3 miles northeastward of Pillau the Lochstädt Forest extends across the peninsula from the sea to the haff. Northward of this forest, on the steep shore of the haff, stands the old castle of Lochstädt.

On the high yellow shore about $1\frac{1}{4}$ miles northward of Lochstädt stands an iron cross named St. Adalbert.

Life-saving.—A lifeboat and rocket apparatus are stationed at Tenkitten, on the beach near St. Adalbert Cross.

Beacon.—A pole beacon, with triangular, topmark, stands on the beach northwestward of the mill at Saltnicken as a mark for the measured distance following.

Measured distance.—A distance of 17,393 yards has been measured for the use of torpedo boats north of Pillau. The south end of the base is marked by Pillau Lighthouse in line with the North Pier Lighthouse; the north end by Saltnicken mill and beacon in line. The line of the base is 11° from the outer (red) buoy off Pillau toward the high land of Great Hubenicken. The depth of water on this line is from 8 to 12 fathoms.

Rothenen Bank.—About 1 mile northwestward of Saltnicken Beacon, and 1,200 yards from the shore, abreast Rothenen Village, lies Rothenen Bank, with $1\frac{3}{4}$ fathoms least water and depths of 4 to 5 fathoms close around. About 1 mile south-southeastward of this bank, and close outside the edge of the 3-fathoms curve, there is a small shoal with $2\frac{1}{2}$ fathoms water, having a depth of $4\frac{1}{2}$ fathoms close to its western edge.

Palmnicken.—About midway between Rothenen Village and Brüster Ort lies Palmnicken Village, celebrated for its amber beds, and easily recognized by its factory chimney. Twelve electric arc lamps are sometimes lighted, which are visible from the sea. Palmnicken is connected by railway with Pillau and Königsberg.

Storm signals, day and night, are shown at Palmnicken.

Life-saving.—There is a lifeboat and rocket station at Kraxte-pellen, about $\frac{1}{2}$ mile northward of Palmnicken Village. Two electric arc lamps, belonging to the mines, are occasionally used at night at Kraxte-pellen.

Palmnicken Bank, with 3 fathoms least water, and depths of 5 to 7 fathoms at a short distance from it around, lies $1\frac{1}{4}$ miles from the shore, abreast Kraxte-pellen. Between the bank and the shore the depths are irregular.

Kreislacken Gründe, a number of rocky shoals, with general depths of 2 to 5 fathoms, but awash in one place, as charted, lies with its outer edge nearly 2 miles from the shore between Palmnicken and Brüster Ort. This shoal is about 3 miles in extent north-east and southwest, having in the channel between it and the shore depths of $3\frac{1}{2}$ to 7 fathoms; on the seaward side the depths increase rapidly to 10 and 12 fathoms.

Brüster (Cape) Ort, the eastern cape of the Danziger Bucht, is a bold, cliffy point having on it a lighthouse and beacon. Brüster Ort is easily distinguished from a distance of several miles when approaching from the northwestward. The point and the coast for $1\frac{1}{4}$ miles southwestward of it are surrounded by a dangerous reef extending $\frac{3}{4}$ mile from the shore. Within the 20-fathom curve, which passes about 3 miles from Brüster Ort, the bottom consists of brown clay, gravel, and rock. It is not advisable to approach the coast between Palmnicken and Brüster Ort nearer than 3 miles, and Brüster Ort should not be rounded nearer than 2 miles.

Light.—The lighthouse on Brüster Ort is an octagonal red tower, 100 feet high, with a black cupola, from which, 194 feet above the sea, is exhibited a fixed and group flashing white light. The fixed light is visible 16 miles and the flash 20 miles.

Signal station.—There is a signal station at Brüster Ort.

Storm signals, day and night, and **Ice** signals are made at Brüster Ort. The storm-signal mast is about 130 yards northward of the lighthouse.

The coast from Brüster Ort trends in an easterly direction 20 miles to Sarkau Forest, where it joins the Kurische Nehrung, a narrow, sandy peninsula extending in a northeasterly and northerly direction 52 miles to Memel Deep. Between Brüster Ort and Alknicken Village, 10 miles eastward of it, the land in some parts is high and wooded. The Kurische Nehrung from Sarkau Forest to Rossitten Village, $12\frac{1}{2}$ miles northeastward of it, is composed of low, barren sand hills; thence the Memel the dunes increase in height, reaching a height of 203 feet near Nidden.

The width of the Nehrung varies from about 400 yards to 1.8 miles.

At Rossitten, Pillkoppen, Nidden, Schwarzort, and Memel are small pine woods. The coast is clean, with no off-lying dangers, the 5-fathom curve being less than a mile from the shore everywhere and about $\frac{1}{2}$ mile for the most part.

Landmarks.—Besides the lighthouses at Bruster Ort and Nidden the most conspicuous objects on the coast are a conspicuous tower with red roof, lying high, with a chimney beside it, close to the village of Rauschen; the houses, water tower, and slender church tower of Kranz; the lookout tower, about $1\frac{1}{4}$ miles northeastward of that place; Nidden Church with steeple; the lookout tower at Schwarzort; and the towers and buildings of Memel.

Kinten Church, on the eastern shore of Kurische Haff, about 18 miles southward of Memel, is a most conspicuous mark from seaward, and can be seen in clear weather for a distance of 30 miles.

Warnicken, Rauschen, and Neukuhren are small watering places, situated $3\frac{1}{2}$, 6, and $8\frac{3}{4}$ miles, respectively, eastward of Bruster Ort, and are connected with each other and with Königsberg and Pillau by railway. At Neukuhren there is a fishing haven where vessels of $9\frac{3}{4}$ feet draft can find shelter.

Light.—A fixed white light, elevated 31 feet above the sea, and visible 4 miles, is shown from the northern end of the east mole of Neukuhren Fishing Hafen. Not shown when ice is in motion. Provisional.

Storm signals, day and night, are shown from a mast on Wanger Spitze, northwestward of Neukuhren Village.

Life-saving.—A lifeboat and rocket apparatus are stationed at Neukuhren.

Kranz, a village and watering place with about 2,100 inhabitants, lies near the southwestern end of the Kurische Nehrung; it is connected by railway with Königsberg and the above-mentioned villages.

Storm signals are shown from a mast on the beach at the eastern end of the Kranz Village.

Life-saving.—A lifeboat and rocket apparatus are stationed at Kranz, also on the shore northwestward of Sarkau and Rossitten Villages.

Nidden Light.—On Urbe Kalis Hill near Nidden, a large fishing village situated about midway between Sarkau Forest and Memel, stands an octagonal red lighthouse, 75 feet high, from which, 223 feet above the sea, is exhibited a flashing white light, visible 22 miles. (For details see Light List.)

Signal station.—There is a signal and telegraph station at Nidden Lighthouse and a telephone station in Nidden Village, northeastward of the lighthouse.

Storm signals, day and night, are made at Nidden Lighthouse, also at Schwarzort, about $14\frac{1}{2}$ miles northward.

Life-saving.—A lifeboat and rocket apparatus are stationed at Nidden, also at Schwarzort, between Nidden and Memel.

Memel—Entrance—Depths.—The entrance to Memel lies between two moles.

The See Gat is that part of the entrance channel lying outside the moles; the depths are signaled from the Center and Signal Beacons.

The channel varies both in depth and direction, particularly in the spring floods, and after a continuance of northerly and northwesterly gales. By latest German plan it has a least depth of 20 feet.

The See Tief is that part of the channel extending from the south molehead to the Schweinsrücken, a sand bank between the Nehrung and the mainland at the entrance to the Kurische Haff. The See Tief is about 4 miles long, from 197 to 328 yards wide in the channel, and has a depth of $19\frac{1}{2}$ to $26\frac{1}{2}$ feet at mean water level.

The western shore of the See Tief is formed by the northern end of Kurische Nehrung, on which there is a battery, a boat harbor, and a wind semaphore station.

Memel Hafen is accessible by vessels of $19\frac{1}{2}$ feet draft from the entrance to the cellulose factory, 1,100 yards southward of the mouth of the Dange; thence to the loading pier of Appelhagen by those drawing 17 feet, and to abreast the Schwienrücken by those drawing 13 feet.

Current.—The prevailing coast current sets northward across the entrance, and may attain a rate of 2 knots. Northerly winds cause a southerly current.

In the See Tief the current generally sets outward when the coast current is setting northward, and inward when the coast current is setting southward. The outgoing current may attain a rate of about 3 knots in the spring. For current signals, see page 456.

Ice.—The southern part of the hafen, the Dange, and the Kurische Haff are frozen over each winter for a long time; northward of the mouth of the Dange the hafen is seldom closed by ice.

When the entrance is closed for long by ice drift from sea, an ice-breaker sets to work from inside and another, summoned from Pillau, from outside, to open the channel.

Water level.—Variations of 2 feet above or below mean level seldom occur, but variations of 1 foot are frequent. The water rises with strong winds from west, through north, to northeast, and falls with southerly and easterly winds. A rise may be sometimes caused by strong northwesterly or southwesterly winds blowing in the western part of the Baltic.

Beacons.—At Bommelsvitte, a suburb northwestward of Memel, there are three black leading beacons, which, in line bearing 116° , lead from the fairway bellbuoy through the See Gat. The Inner or Great Beacon is a fixed structure 123 feet above the sea, and con-

structed of iron latticework in the shape of a pyramid; it is surmounted with a triangle, above which a barrel is fixed horizontally, and over the latter an upright cross.

The Center directing beacon is 95 feet high, and stands nearer the sea, bearing 296° , distant 365 yards from the inner leading beacon; it is constructed of wood in pyramid form, with a mast in the middle; a triangle and a barrel are fixed at the top, similar to those on the inner beacon; this beacon is made to be lowered if necessary.

The Outer or Signal Beacon is 65 feet high, and lies still nearer the sea, in the same line northwestward from the Center Beacon at a distance of about 49 yards; it stands close to the water and bears a red ball as top mark; it is made to be lowered if necessary, like the Center Beacon.

A little to the northward of the lighthouse, at the edge of Memel Forest and not far from the seashore, are six beacons, each about 70 feet high, bearing red triangles, and northeastward of them a large beacon, called the Weldbeacon, with a triangle and cross above it as top mark. These beacons are placed merely for the use of the pilots.

The middle of the channel southward of the mouth of the Dange is marked by two red wooden leading beacons, with triangular top marks, 39 and 49 feet high, respectively, situated on the coast of the Nehrung, 1.7 miles southward of the Dange Entrance. The northern beacon has a cross beam under the top mark. In line they bear 164° .

About $\frac{1}{2}$ mile northward of the beacons just mentioned are two white wooden beacons with triangular top marks, 33 and 39 feet high, respectively, which in line bearing 253° mark the point where the line of the last-mentioned pair of leading beacons should be quitted.

The middle of the fairway, toward the cellulose factory, is marked by two red wooden beacons 26 and 33 feet high, respectively, erected on the lands and pier of the factory; the northern beacon has a diagonal cross, and the southern a triangle, as top mark. In line they bear 138° .

Buoys—Fairway bell buoy.—A black and red bell buoy, with ball top mark marked "Memel," lies off the entrance to the See Gat about $1\frac{1}{2}$ miles west-northwestward from the end of the North Mole. It sounds only in a rough sea.

The See Gat is marked on the starboard side, entering, by three red spar buoys with small red flags, and the inscriptions "A," "B," "C," and on the port side by three black conical buoys marked "1," "2," and "3." The buoys are moved as necessary to meet alterations in the channel. Similar buoys are laid out in winter.

The See Tief is marked on the western side by 3 red spar buoys with small red flags and the inscriptions "D," "E," "F."

Telegraph buoys.—Abreast the leading beacons, at Bommelsvitte two green spherical buoys with cross top marks, one on each side

of the channel, mark the position of a telegraph cable. Anchoring in the vicinity is prohibited.

In September bow nets for lamprey fishing are laid out on both sides of the See Tief from the north end of the rubble wall at the northern ballast place near the leading beacons to the lighthouse. The clear channel on this stretch, about 220 yards in width, is marked on the starboard side by three red and on the port side by three black spars with small white flags.

A warping buoy lies off the entrance to the Winter Hafen.

Lights—Memel.—On the northeastern side of the entrance to Memel, about 1,600 yards northwestward from the inner leading beacon, stands a circular lighthouse painted in red and white checkers, 79 feet high, from which is exhibited, 97 feet above the sea, an occulting white light, visible 15 miles. Should the occulting light fail, a fixed white light will be shown. (For details see Light List.)

About 265 yards 263° from the above light there is a pole with gray lantern, 23 feet high, from which a fixed red fishing light is exhibited 28 feet above the sea; unwatched. These lights in line lead 55 yards outside the head of the south mole. (See Light List.)

North Mole.—On the north molehead, about 1,200 yards 287° from the main light, stands a white circular tower, 28 feet high, from which, 33 feet above the sea, is exhibited a fixed red light, visible 7 miles. (For sector see Light List.) Unwatched.

South Mole.—A fixed green light, elevated 23 feet, and visible 3 miles, is shown from a white post, 13 feet high, on the South Molehead. Unwatched. (See Light List.)

Range lights.—Two fixed white range lights are shown, the rear one at an elevation of 52 feet, on the middle or Directing Beacon, the front at an elevation of 30 feet, from a gray hut near the shore. These lights in transit indicate that the beacons are in line. Should the fairway be obstructed, the lights are not exhibited. Unwatched.

A fixed red fishing light, elevated 22 feet and visible 3 miles, is shown from a dark gray column, 17 feet high, on the north mole of the fishing haven at Bonnmelsvitte. It is shown from September 1 to May 1. (For sector see Light List.)

Two fixed lights are exhibited at the entrance of Dange River, red on the north side and blue on south side, at the height of 16 and 19 feet, respectively. Unwatched.

Memel Hafen comprises that part of the See Tief between the northern ballast place and the entrance to the König Wilhelm Canal near Schmelz Village, also the Winter Hafen and the Dange River from its mouth to the railway bridge. On the eastern side of the See Tief are the Holz Hafen and timber ponds, separated from the

channel by piles, also a sawmill. Vessels of 17 to 19½ feet draft can lie alongside the loading piers built out from the timber ponds.

Northwestward of the town, in the neighborhood of the range beacons, is the northern ballast place, a wharf 186 yards long, with a depth of 13 feet, and about 750 yards southward on the same side is the southern ballast place, a quay 328 yards long, where vessels of 19½ feet draft can lie. At the southern ballast place there are two fixed cranes of 12½ and 35 tons, belonging to the government. Adjoining this is the Winter Hafen, a basin with a depth of 2 to 3½ fathoms, and with 765 yards of quay.

The Dange River flows through the town, and discharges into the hafen between Neustadt and Altstadt. It is navigable for 1½ miles, as far as the railway bridge, and has a depth of about 14 feet in mid-channel at mean water level. On both sides of the river, inside the town to about 330 yards above the Börsen Bridge, are quays, loading piers, and wharves.

The Winter Hafen, northern and southern ballast places, and the north bank of the Dange are connected with the railway.

There are three bridges over the Dange; the Karls Bridge, an iron lift bridge, with an opening 65 feet in width; Börsen Bridge, a swing bridge, with an opening of 56 feet; and the Memel Railway Bridge, an arched fixed bridge with a clear width of 39 feet. The State railway has a pair of sheers at the railway bridge.

Pilots.—Pilotage is compulsory, except for German vessels of war and for vessels of less than 9 feet draft or not more than 170 cubic meters capacity, but in such case the exemption is only on leaving, and the master has to report himself beforehand at the pilot office; certain local craft are also exempt.

Pilots meet vessels in the road in a two-masted pilot steamer or steam launch, flying the Prussian pilot flag. The service is carried on in the daytime only. If the weather be so bad that the pilots can not board vessels, then the pilot flag on the pilot vessel will be lowered; should the wind and other conditions, however, permit entering the hafen, a red flag will be hoisted instead of the pilot flag, as a signal that the pilot vessel intends to proceed into harbor, and that the vessel is to follow. At the same time the Signal Beacon will be held in readiness, in order to make the signals mentioned hereafter.

A yellow flag exhibited on top of the lighthouse indicates that pilots can be obtained.

The station has 4 chief and 13 sea and 3 assistant pilots; also 1 chief and 6 hafen pilots. Pilotage is included in the harbor dues.

Signals.—A red ball hoisted on the staff on the eastern side of the principal lighthouse indicates that the entrance to the port is impossible.

Depth signals.—A red flag, hoisted on the Signal Beacon to guide a vessel into the haven, denotes a depth of $19\frac{1}{2}$ feet in the See Gat.

Each black ball hoisted on the south side of the middle beacon indicates 1 foot less than $19\frac{1}{2}$ feet in the channel, and each ball on the north side 1 foot more than $19\frac{1}{2}$ feet. Thus two balls on the south side indicate $17\frac{1}{2}$ feet. Two balls on the north side indicate $21\frac{1}{2}$ feet.

Vessels may enter during gales from the west, the northwest, and north, by acting in strict accordance with the signals made by the Signal Beacon.

Signal Beacon.—When a large red flag is hoisted upon the Signal Beacon, vessels finding no pilots at sea in onshore gales, and obliged to enter without one, should act in strict accordance with the signals made from this beacon; that is to say, they should steer in the direction either north or south pointed to by the beacon bearing the red flag and the red ball, until they see the same beacon standing perpendicularly, in which case they are to steer as they go. Having by these means passed the outer point of the north mole and reached smoother water, a pilot boat will be found waiting, and the pilot is to be taken on board.

Those entering in this manner should set as much sail as possible, and even if the wind be right aft headsail should be set, so that the ship may be quickly brought back into the channel course in the event of a heavy sea striking her and throwing her broadside across the channel.

As the above-mentioned rules for guiding vessels into the haven can only be applied to one vessel at a time, two or more vessels should on no account enter simultaneously. The guiding of the next following vessel into the harbor by the means of the Signal Beacon can only take place after the first has entered between the two moles and has received a pilot.

If the Signal Beacon and the Center Leading Beacon are both lowered, entering is dangerous; should a vessel run in in spite of this, the Signal Beacon will be set up again, and the guiding signals made. See Directions.

International code signals are made from the Centre Directing Beacon.

Current signals.—On vessels entering, and in order to denote the direction of the current, a blue flag will be hoisted on the western side of the pilot tower when the current is running out, and the same flag will be hoisted on the eastern side of the pilot tower if the current is running in. This tower of white stone stands upon the southern ballast quay; it lies nearly $\frac{1}{2}$ miles 145° from the Signal Beacon.

Wind signals.—Signals indicating the strength of the wind at Libau and Brüster Ort are shown from the wind semaphore on the Nehrung, as at Hela. From seaward, the force and direction on the northern side refer to Libau, and those to the south to Brüster Ort.

Storm signals, day and night, are shown at Memel from a mast situated near the pilot office.

Tugs.—Vessels requiring the assistance of a steam tug from the road to the harbor should hoist two flags at the gaff.

Anchorage in Memel Road will be obtained in a depth of 10 to 12 fathoms, sand and clay, with the beacons in line bearing 114° , and the Holländische Mütze (Dutch Cap) from 17° to 28° ; by night, in the same depth, with the fixed white light bearing 108° . It is not a safe anchorage with winds from the western semicircle, which quickly raise a heavy sea. The holding ground is good.

Directions.—When approaching Memel from the westward, the Holländische Mütze (Dutch Cap), a small wooded hill, 85 feet high, lying 4 miles northward of the lighthouse, is a good landmark, as is Memel Forest, northward of the lighthouse; also the pine wood of Schwarzort, upon Kurische Nehrung, about 12 miles southward of Memel Lighthouse; this wood, lying above the sand hills, can be seen from a considerable distance seaward.

On a nearer approach Memel will be known by the high and slender steeple of the Lutheran Church, built in stories which gradually decrease in breadth, and in clear weather is visible at a distance of 25 miles; also by two other church steeples, many windmills, the three beacons, and the lighthouse on the northeastern side of the entrance to the harbor. The high steeple of the Lutheran Church lies southeastward from the lighthouse, $1\frac{3}{4}$ miles distant.

During thick weather, should the land be observed suddenly, a vessel will be north of Memel if it be wooded, and south if sandy.

As soon as the lighthouse is seen, bring it to bear 108° , and steer this course until the three beacons, which should be brought in line on a 116° bearing, are in sight. With these marks on, the outer buoy will be seen, and should be left to port.

During gales between west-southwest and north, when the pilots are unable to get out, vessels of less than $15\frac{1}{2}$ feet draft can run in with the assistance of the signals from the Signal Beacon; when between the moles, speed must be reduced to take the pilot on board.

On sailing into this channel without a pilot, due allowance should be made for the current, which, according to circumstances, sets across the channel very strongly either from the northward or from the southward.

If the Signal and Center Beacons are lowered, no vessel should attempt to enter except from urgent necessity, but should endeavor to cruise clear of the land, and only after this has been found impracticable should she anchor.

If a ball is hoisted on the main lighthouse no vessel can enter under any circumstances.

Vessels requiring a tug come as near as possible to the fairway buoy and hoist two flags from the gaff.

During heavy gales from the southwest, west, or northwest quarters those in charge of vessels of heavy draft are strongly recommended to lie to at a distance of 40 to 50 miles from the coast and not to approach Memel before the force of the gale has abated. During these gales the sea in the vicinity of the entrance channel is very high and produces a tremendous surf; in such weather a vessel could not enter the harbor with safety.

During gales from south or southwest no sailing vessel should venture to enter the harbor, as on such occasions the outer or coast current running to the northward might cause her to strand near the north mole.

At night Memel main light should be steered for as directed above by day, and from the outer buoy run in on the line of the range lights.

Memel is situated on the right bank of the See Tief, the outlet of Kurische Haff, and contains a population, including the suburbs, of about 31,500; Altstadt, the principal part of the town, stands on the left bank of the Dange, a small river running through Memel, and emptying itself into the See Tief; Neustadt stands on the right bank of this river, and adjoining it on the north is the suburb of Bommelsvitte. Fronting the Altstadt and facing the See Tief there is an old citadel with earthworks. The principal industries carried on are cellulose, wood pulp, artificial manures, iron foundries, and ship-building.

Communication.—There is communication by trading steamers with the important ports of Great Britain and other countries throughout the year, and regularly in summer with Kranz, Rossiten, Nidden, Schwarzort, Königsberg, Russ. and Tilsit on the inland channels, as well as by sea with Stettin, Lübeck, and Rotterdam.

Memel is connected by railway with Russia, via Bajohren, with Tilsit, Königsberg, and the interior of Prussia; and by electric telegraph to all parts. The telegraph office is always open.

Patent slips.—See Appendix I.

Repairs to hull or machinery can be effected at Memel, where there are two iron foundries and machine-making works. Nearly $2\frac{1}{2}$ tons of metal can be melted and run at one time, cylinders of 30 inches can be cast and bored, boilers up to 20 tons can be repaired, shafts of 6 inches diameter can be forged and 12-inch diameter turned, 12-inch pipes can be brazed, masts made, and boats built.

The Hafen Board of Works has diving gear.

Tugs are available.

Trade.—The principal articles of export are timber, grain, flax, hemp, cellulose, and chemical products; the imports, coal, manures, ore, limestone, and herrings.

Supplies.—Provisions are plentiful. Water, good, cheap, and fit for drinking, is brought alongside in a tank vessel from the tow supply.

Coal can be obtained at Memel, where about 5,500 tons are usually kept in stock; there is a coal wharf 700 feet long, where the depth is 20 feet. About 169,600 tons of coal were imported in 1912.

Quarantine.—A quarantine and disinfecting establishment is on the Nehrung by the south mole.

Hospitals.—There are two fine hospitals belonging to the town, in which sailors are received. There is also a garrison hospital.

Life-saving.—At Memel there are two life-saving stations; one with lifeboat and rocket apparatus on the Nehrung, about 1,400 yards southward of the south mole, and the second, with lifeboat, on the northern ballast place at Bommelsvitte. The Memel Station is connected by telephone with the stations between Nidden and Nimmersatt.

Harbor regulations.—The harbor of Memel includes the Fort Moat.

Small craft must give way to vessels in the river and channel as far as the fairway buoy.

On arrival the vessel must be reported at the pilot office, when a berth will be allotted. The vessel must be moored according to the instructions of the harbor master and must not shift berth without permission, but must shift berth if required to do so by the harbor master.

Steamers entering or leaving the Dange must give a long blast with the steam whistle and must move at a slow speed, ropes and hawsers being kept clear and ready for use if required.

In working ballast at least 50 tons must be loaded or discharged in the day, and none must be allowed to fall into the water. No rubbish, ashes, or sweepings may be discharged into the harbor.

A watch must always be left on board.

Vessels with explosives, petroleum, and other inflammable articles are subject to special regulations as to anchorage, working cargo, etc., which must be strictly adhered to. They must hoist a black flag with a white P, and at night a white light over a red. Fire and smoking are prohibited in sailing vessels, and smoking in steamers, so loaded.

Open fires are not allowed in the Dange and Fort Moat without the harbor master's permission, and during the loading and discharging of inflammable goods, such as flax, hay, etc., fires and smoking are prohibited.

Deviation.—There is a dolphin for swinging purposes for vessels of 9½ feet draft in the Holz Hafen; from it the main lighthouse bears 323°.

In the Winter Hafen there is also a dolphin for the same purpose, which can be used by vessels drawing 18 feet; from it the lighthouse on the north mole bears 310°.

König Wilhelm Canal.—The König Wilhelm Canal connects the southern end of Memel Hafen, at Unter Schmelz, with the Dravöhne and Minge Rivers, the latter of which discharges into the Atmath Strom. The canal serves principally for the transport of wood, which comes from Russia, by the Niemen, in rafts and river craft. The canal is 105 feet wide at the surface of the water, 57 feet at the bottom, 6 feet deep, and on its west side has a towing path 6 feet wide; it is crossed by ten iron lift bridges, with openings 31 feet wide, the headway under them being 17 feet. A lock 520 feet long and 36 feet wide in the entrance protects the canal from flood water of the Minge.

The inland navigation to Königsberg passes through the König Wilhelm Canal, the Minge, Atmath, Russ, and Gilge Rivers, the Seckenburger Canal, Great Fredericks Dyke, the Dieme, and Pregel, but the Kurische Haff may be used as far as the mouth of the Dieme.

Kurische Haff, separated from the Baltic by the Kurische Nehrung, is the largest inland sea on this coast; it is 50 miles long north and south, 25 miles wide in its southern part, and decreases gradually in width northward to the southern end of Memel Hafen, where it is about ½ mile wide. In the northern part of the haff there are general depths of 3 to 9 feet, and in the southern from 2 to 3½ fathoms.

The channel in the shoal north part of the haff has been improved by dredging and runs mostly at a short distance from the Nehrung shore from the Schweinsrücken Shoal to Birschtwin Haken.

From Schwarzort, southward to Sarkau, the haff side of the Kurische Nehrung is much indented, in contrast to the sea side.

The shoal banks north and south of the mouth of the Atmath are overgrown with high rushes and reeds.

Local knowledge being absolutely necessary, no particular description of the haff is given.

Local magnetic disturbance.—See index chart, facing page III, and Caution, Chapter I.

Ice.—The haff is frozen over in winter for a long time; the inland navigation is generally closed at the end of November and opened again at the end of March or beginning of April.

Water level.—As a rule the water rises with northerly winds about 1 foot above and falls with southerly winds about 8 inches below the mean level. The highest level reached on the gauge at

Schwarzort, when there was no ice, was $3\frac{3}{4}$ feet, and with ice drift $4\frac{3}{4}$ feet above the mean, and the lowest was $2\frac{1}{2}$ feet below the mean; but these large variations seldom occur.

Depths.—In the channel from Memel to the mouth of the Atmath and to Russ the depth is $7\frac{1}{2}$ feet; to the mouth of the Nemonien, $6\frac{3}{4}$ feet; to the Deime and the Beek, near Kranz, $8\frac{1}{4}$ feet.

Pilots.—There are no pilots for the Kurische Haff.

Beacons.—Two pyramidal beacons, with horizontal battens on the upper half and cross top marks (the outer with two crossbeams), stand on the Nehrung, southwestward of Unter Schmelz and near Erlenhorst. These beacons in line lead westward of a shoal in the passage between Schwarzort and Memel. Fixed white lights are shown from the beacons.

Surveying beacons.—Three pyramidal surveying beacons, which are conspicuous from seaward, and will probably stand some years, have been erected as follows:

A beacon 33 feet high on a hill 164 feet high, about 50 yards to the westward of Nidden Lighthouse.

A beacon 36 feet high on a hill 197 feet high, $5\frac{1}{2}$ miles to the southward of Schwarzort.

A beacon 121 feet high, about 200 yards northeastward of Windenburger Lighthouse.

Buoys.—The narrow channel beginning at the Schweinsrücken Shoal and ending at Birschtwin Haken, is marked by buoys on one or both sides, red spar buoys on the west, and black conical buoys on the east.

Lights.—For lights in the Kurische Haff, see Light List.

Inland navigation and canals.—The Memel River, rising in Russia, and there named the Niemen, discharges on the low eastern shore of the Kurische Haff by numerous branches, of which the Atmath and Nemonien have some importance for navigation. The town of Tilsit lies about 32 miles from the mouth of the Atmath; from the bifurcation of the river at Kallwen, as far downwards as the town of Russ, where several arms branch off, it is named the Russ, thence to the mouth it is named Atmath Strom.

The Minge River, from the north, discharges into the mouth of the Atmath, and is connected with Memel Hafen by the König Wilhelm Canal.

The Deime River discharges in the southeastern part of the haff, and at Labiau, 2 miles above the entrance, is connected with the Nemonien by the Great Fredericks Dyke (Grosse Friedrichs Graben). This canal is 10.3 miles long, with a water surface width of 128 feet, and by dredging a bottom width of 65 feet and a depth of $6\frac{3}{4}$ feet are maintained. The depth in the Deime below Labiau is about $9\frac{1}{4}$ feet.

The Seckenburg Canal connects the Nemonien with the Gilge; it is $2\frac{1}{2}$ miles long, with 164 feet surface and 131 feet bottom width and a depth of $6\frac{1}{4}$ feet. These canals are used more for the navigation between Königsberg and Tilsit than for that between Königsberg and Memel.

The small Beek River, in the southwest angle of the haff, has a depth of $6\frac{1}{4}$ feet.

The Atmath Strom discharges southward of Windenburger Eck; from the entrance to the town of Russ, about $6\frac{1}{2}$ miles up, the depth is $7\frac{1}{2}$ feet, thence to Tilsit $7\frac{1}{4}$ feet. After heavy ice drift the entrance channel is silted up, but is deepened again by dredging.

Labiau, a town with about 4,500 inhabitants, lies about 2 miles southward of the entrance to the Deime River. It has railway communication with Königsberg and Tilsit.

There are numerous villages and some small harbors, the entrances to which are buoyed and lighted, on the shores of the Kurische Haff, for which see the chart.

Storm signals, day and night, are shown at Schwarzort, Pillkopen, Rossitten, and Sarkan, on the Nehrung side of the Kurische Haff; at Rinderort, on the southern side; and at Inse, Karkelln (Karkeln), Atmath Strom entrance, Windenburger Eck, and Drawöhnen, on the eastern side. At Inse the day signal is the ball only.

The coast from Memel trends in a northerly direction 10 miles to the boundary between Prussia and Russia. North of Memel there are but few objects by which this part of the coast can be recognized from seaward; the wooded elevation known as the Holländische Mütze (Dutch Cap) is the only conspicuous object. About 10 miles from the coast there are depths of 18 to 23 fathoms, fine sand, decreasing gradually toward the 5-fathom curve, which in some parts extends nearly 1 mile from the shore. Within the 10-fathom curve, which lies about 2 miles from the coast, the bottom is rocky; about $4\frac{1}{2}$ miles northward of Memel Entrance and $1\frac{1}{2}$ miles from the shore is a patch of $4\frac{1}{2}$ fathoms.

Storm signals, day and night, are shown at Försterei Station, from a white mast on the beach about 2.3 miles northward of the entrance to Memel; at Karkelbeck, about 4 miles farther north, on the slope of the coast near a mill; and about $1\frac{1}{2}$ miles southward of Nimmersatt, a village close to the frontier between Prussia and Russia.

Life-saving.—Two lifeboats and a rocket apparatus are stationed at Melneraggen; the shed stands on the beach about 1,200 yards northward of the north mole of Memel.

A lifeboat and rocket apparatus are stationed at Karkelbeck, and also at Nimmersatt about 1,600 yards south-southwestward from the village. All these life-saving stations have telephonic communication with the adjacent stations.

CHAPTER VIII.

THE KOURLAND COAST FROM THE BOUNDARY BETWEEN PRUSSIA AND RUSSIA TO ODENSHOLM, ESTHONIA COAST, INCLUDING THE GULF OF RIGA, WITH ÖSEL AND DAGÖ, EXCEPT THE NORTHWESTERN COAST OF THE LATTER.

The Kourland Coast, from the boundary between Prussia and Russia, trends in a northerly direction 56 miles to Stein Ort, then north-northeastward 50 miles to Lyser Ort, thence in an east-northeasterly direction 31 miles to Domesness, the southern point of the Gulf of Riga. The coast between the boundary and Libau, 37 miles northward of it, is low and covered with plantations. From Tosmar Lake 2 miles north of Libau to Stein Ort the shore is composed of sand backed with sand hills, mostly wooded, which attain a height of 60 feet near Strandhoff, a short distance northeastward of Stein Ort. Southward and northward of Libau, the land is cultivated between the low sand hills close to the coast and the fir woods, which begin about a mile inland.

Tiupkaln Hill, 14 miles southward of Libau, is a wooded height connected with a range of low hills named the Sevenbergen, some of which have a few trees.

Depths.—The bottom eastward of the 20-fathom curve is composed of sand, and to the westward mud. Extending from the shore there are depths of $4\frac{1}{2}$ fathoms, with 7 and 8 fathoms close outside, and within the 5-fathom curve depths of $2\frac{1}{2}$ fathoms, with 3 and $3\frac{1}{2}$ fathoms close around; elsewhere the general depth at the distance of 2 miles seaward is 7 or 8 fathoms.

About $4\frac{1}{2}$ miles northwestward of Tiupkaln Hill, and 3 miles offshore, is a rocky bank with 4 fathoms least water and from 6 to 10 fathoms around.

Abreast the southern end of Tosmar Lake, Libau Bank, a shoal flat extends seaward 4 miles, within the limits of which the depth is from 3 to 5 fathoms.

Between Tosmar Lake and Stein Ort the general depth 2 miles from the shore is 7 to 8 fathoms, increasing gradually to 20 fathoms at 10 miles. About 4 miles northward of Tosmar Lake, and between 1 and $2\frac{1}{2}$ miles from the land, there is a bank with 4 to 5 fathoms, between which and Stein Ort there are occasional depths of 5 to $4\frac{1}{2}$ fathoms at a distance of from 1 to $1\frac{1}{2}$ miles from the shore, deepening suddenly to 6 and 9 fathoms.

Current.—The coast current is dependent on the wind for its direction and strength. It follows the coast northward or southward, and attains in strong winds a rate of 2 knots.

Polangen, the Russian border town, stands near the beach, and northward of a plantation extending to the seashore; only a few of the houses, however, can be seen from seaward. The church is a cruciform building, with gray roof and small green spire in the center; it can not be easily seen owing to the surrounding woods.

Landmarks.—A good object by which to recognize this locality is a large windmill situated northward of Polangen. Biruta (Birutta) Hill, a little southward of the town, is also a useful mark.

Svent Church is white with a green tower; a windmill lies northward of it.

Shoals.—Off Polangen, $1\frac{1}{4}$ miles from the shore, are three detached patches of $4\frac{1}{4}$ fathoms, and one doubtful patch of 5 fathoms. About $2\frac{1}{4}$ miles northwestward of Polangen Church, and $1\frac{1}{2}$ miles offshore, the depth is $3\frac{1}{4}$ fathoms, close to the 5-fathom curve.

Life-saving.—A lifeboat is stationed at Polangen, and a lifeboat and rocket station at Svent, a village on the coast 6 miles northward.

Pappenze (Pogranichni) Light.—Near Pappenze Village, from a white iron framework tower, 63 feet high, a flashing white light is exhibited 69 feet above the sea. (For details see Light List.) There is a telephone station at the lighthouse.

Life-saving.—There is a life-saving station at Pappenze, southward of the lighthouse, and a rocket apparatus at Virgin, a village on the coast about 2 miles southward of Bernaten Beacon.

Bernaten—Beacon.—On the coast near Bernaten, about 13 miles north of Pappenze Light, stands a pyramidal-shaped beacon, 42 feet in height, surmounted with a ball, and painted black and white in horizontal bands.

Fog signal.—Close to the above beacon, during thick or foggy weather, explosive reports are made.

Bernaten Reef is dangerous rocky ground extending nearly 2 miles from the shore in the vicinity of Bernaten Beacon. The wreck of the *Vernon*, lost on these shoals, which has a depth of 1 foot over it, is situated on the edge of the 3-fathom curve, in latitude $56^{\circ} 22' 50''$ north, longitude $20^{\circ} 55' 20''$ east.

At night this reef is covered by the red sector of light shown from Libau Lighthouse.

Buoys.—Five black and white spar buoys, each surmounted by two black brooms with bases turned toward each other, mark the danger limit abreast of Bernaten Reef, Libau Approach.

These buoys are placed in line north and south, about 600 yards apart, the center buoy being about $2\frac{1}{2}$ miles from the shore.

Light and whistle buoy.—A red light and whistle buoy, showing an occulting white light every 10 seconds, thus: Light, 5 seconds; eclipse, 5 seconds, is moored in $8\frac{1}{2}$ fathoms on the western side of Bernaten Reef, outside the spar buoys. The whistle is sounded by the motion of the buoy on the waves.

Libau Bank—Buoys.—Libau Bank, with depths upon it under 5 fathoms, extends westward from the shore, abreast Libau and Port Emperor Alexander III, and in the vicinity of the North Mole of Libau, projects to the distance of 4 miles, and forms a point about 3 miles 282° from the southern end of the North Detached Breakwater. This point is marked by two white and black striped spar buoys, each surmounted by two black brooms with bases turned together; the buoys are placed about 300 yards apart in an east and west direction.

Two small 3-fathom patches upon the bank lie, respectively, 1.4 miles 272° and $1\frac{1}{2}$ miles 282° from the northern extreme of the North Detached Breakwater. Depths of $3\frac{1}{2}$ and $4\frac{1}{4}$ fathoms lie near the western extremity of the bank.

Light buoy.—A red light buoy, showing a flashing white light is moored in 6 fathoms about $\frac{1}{2}$ mile westward of the buoys on the western extremity of Libau Bank and about $4\frac{1}{4}$ miles 295° from Libau Main Lighthouse. About 700 yards southeastward of the lightbuoy is a patch of 5 fathoms.

Libau Light Vessel exhibits from the foremast an occulting white light elevated 59 feet above the sea. (For details see Light List.)

Signals are made with flags and rockets when vessels are seen standing into danger.

The light vessel, with two masts and a black funnel, is painted red, with a white horizontal band and marked on each side “Либавскій” in black. On the mainmast is a black ball, 54 feet above the sea, also a yard.

The light vessel is moored in a depth of $9\frac{1}{2}$ fathoms $3\frac{1}{4}$ miles outside the middle entrance to Port Emperor Alexander III, with Libau range beacons in line, bearing 68° , and remains on station throughout the year, unless temporarily withdrawn owing to ice.

NOTE.—When necessary the vessel will be replaced by a relief light vessel. (See Chapter I.)

Fog signal.—During thick or foggy weather a siren is sounded. (See Light List.)

A submarine fog bell is also sounded at the light-vessel.

Caution.—The dredgers engaged in deepening Libau Harbor show electric lights during the progress of the works.

Libau—Entrance channel—Depth.—A channel about 1.4 miles long and 200 feet wide, with a depth of 30 feet, has been dredged

through the Libau Bank in an east-northeast direction to the middle or western entrance to Port Emperor Alexander III at Libau.

Bell buoys.—The seaward entrance to the above channel is marked by two bell buoys; that on the northern side of the entrance being painted red and surmounted by a ball under an up-turned broom and that on the southern side painted white and with ball under down-turned broom.

Range beacons.—Iron framework towers are erected to serve as leading range marks through the dredged channel and entrance to Port Emperor Alexander III. The front beacon, upper half dark red, lower half white, 66 feet high, and 70 feet above the sea, stands on the eastern side of the temporary harbor southward of the entrance to the basin and docks canal; the rear beacon, lantern black, lower part of beacon white, 86 feet high and 107 feet above the sea, is situated about 1,100 yards 68° from the front beacon. These beacons in line, bearing 68° , lead through the dredged channel to the entrance to the port.

Lights.—On the southern side of the entrance to Libau Old Harbor, opposite the customhouse, stands a circular tower, 95 feet high, painted in red and white horizontal bands, with the lantern and gallery red, from which, 103 feet above the sea, is exhibited a fixed and flashing light with white and red sectors. (For details see Light List.) Telephone station.

Range lights.—From the two range beacons established as marks for vessels proceeding through the dredged channel into Port Emperor Alexander III lights are exhibited as follows: On the rear beacon, two flashing lights vertical, white over red, elevated 107 feet; on the front beacon, two flashing lights vertical, red over white, elevated 70 feet, so that when the beacons are in line bearing 68° the lights will appear as two red lights between two white lights. (See Light List.)

Harbor lights—Middle Entrance.—The central passage into the port is marked by a fixed red light, exhibited above a fixed white light, from a support, painted upper half red, lower part white, at the southern end of the North Breakwater; the upper light is elevated 34 feet above the sea and 17 feet above the breakwater.

On the northern end of the South Breakwater a fixed white light, elevated 39 feet, is shown above a fixed red light, from a support, painted upper half white, lower part red, 22 feet in height.

Northern Entrance.—An occulting red light is shown from a red support at the western end of the North Mole, 29 feet above the sea and 12 feet above the mole.

An occulting green light is shown from a green support on the northern end of the North Detached Breakwater at the same respective elevations. Both lights are unwatched.

Southern Entrance.—A fixed green light, 9 feet above a fixed white light, is shown from a white iron support at the southern end of the South Detached Breakwater; the upper light is elevated 38 feet above the sea and 21 feet above the breakwater.

A fixed white light is shown 9 feet above a fixed green light from a white iron tower on the northern extremity of the Commercial Mole; the upper light is elevated 39 feet above the sea, 26 feet above the mole.

Temporary Harbor.—An alternating white and red light is exhibited from the end of the North Mole of Temporary Harbor, and an alternating white and green light is shown from the head of the South Mole.

Commercial Port.—On the southern end of the Internal Breakwater (which forms the western side of the Commercial Port) a fixed white light is exhibited 20 feet above the sea, from a gray iron mast, 13 feet high. A fixed white light is also shown from a similar mast on the outer corner of the mole at the south side of the entrance to Commercial Port, and a fixed blue light from the inner corner of this molehead.

On the outer end of the mole separating the Naval and Commercial Ports, from a mast 10 feet high, a fixed green light is exhibited 17 feet above the sea.

Winter Harbor.—A fixed red light is exhibited at the western angle of the North Mole of the Winter Harbor, 890 yards 315° from Libau Main Light; the light is shown 20 feet above the sea from a gray iron mast, 11 feet in height.

Fog signals.—A fog bell will be rung during thick or foggy weather at the northern entrance to the Man-of-War Port, on the head of the North Mole on the eastern side of the entrance.

During thick or foggy weather a fog bell will be rung on the north molehead of the Temporary Harbor at Libau.

Abnormal variation.—The magnetic variation in the Man-of-War Port was found in May, 1913, to be 3° 08' west at sea, off the entrance buoys, 3° 45' west, and at Libau Light Vessel 4° 10', decreasing 09' 05" annually.

Signal Station.—At the Pilot Tower, a white octagonal stone tower, 60 feet high, situated $\frac{1}{4}$ mile southeastward of the main lighthouse, there is a signal and semaphore station. Libau Lighthouse is in telephonic connection with the telegraph system.

Pilots—Instructions for merchant vessels.—The pilot station is in the neighborhood of the main lighthouse, $\frac{1}{4}$ mile southeastward of which is the Pilot Tower. The pilots do not go out at night.

A pilot will meet all merchant vessels outside the port during daylight, but no vessel will be allowed to enter the harbor on the approach of dusk or at night without special permission.

On arrival in the entrance to the Man-of-War Port, a boat from the guard ship will meet and accompany the vessel to her berth and there hand her over to the customs authorities. Until this is done no boat or vessel of any description will be allowed alongside. Should there be any delay in the arrival of the guard ship's boat, the vessel must anchor or remain under steam lying to in the center of the Man-of-War Port.

A copy of these regulations in Russian, French, or English will be handed by the pilot to the masters of all vessels arriving at the port.

In addition to the pilot charges a Government tax per net register ton in and out is payable. Pilotage is compulsory for merchant vessels.

Port.—Very extensive harbor works have been carried out of late years and are not yet completed; moles and breakwaters inclosing a space 2 miles in extent north and south by 1 mile wide have been constructed to form both a naval and commercial port.

Port Emperor Alexander III, or the Man-of-War Port, is formed by the North Mole, extending westward from the shore, by two detached breakwaters on the west extending in a northerly and southerly direction, and by the Commercial Mole on the south, extending north-westward and forming a prolongation of the southern quay of the Old Harbor. The northern and greater part of this port is for the use of war vessels, and in it are a number of mooring buoys; in the southern part is the Commercial Port. There are three entrances; the two northern are used by vessels of war, the southern by merchant vessels.

The depth in the greater part of the Man-of-War Port is from 19 to 32 feet. The channel leading to the port through the middle entrance, together with an area off the approach to the docks bounded on the north by three red spar buoys and on the west by a line joining the southern point of the north detached breakwater and the western red buoy, has been dredged to a depth of 30 feet, but on and near the line of leading beacons in the port depths of $28\frac{1}{2}$ and 29 feet have been reported; vessels drawing more than 27 feet should not attempt to enter the harbor. The port is to be dredged to a depth of 32 feet.

On the eastern side of the Man-of-War Port midway between the North Mole and the Commercial Port is a temporary harbor, about 350 yards in extent and 5 to 32 feet deep, formed by moles, from which a canal, 300 feet wide on the floor and 32 feet deep, leads to the basins and dry docks.

The Commercial Port, situated in the southeastern part of Port Emperor Alexander III, is separated from the Man-of-War Port by a mole on the north side, extending $\frac{1}{2}$ mile westward from the shore, and on the west by an internal breakwater nearly 800 yards long in a northerly and southerly direction. It has been dredged to a depth of 28 feet in the southern part; in the southern entrance to this port the depth is 27 feet. Large vessels now use the Commerical Harbor, and can be berthed alongside the quays; a steamer of about 7,500 tons carrying capacity has been loaded here. The greater part of the harbor has depths of 8 to 13 feet; the northern entrance has 14 to 16 feet. There are several mooring buoys in the port.

The Winter Harbor, situated between the Commercial Port and the Old Harbor, is about 650 yards in length and 250 yards wide; it has a uniform depth of 22 feet. There are mooring buoys at the east end.

The entrance to the Old Harbor of Libau is formed by two stone moles extending in a northwesterly direction. The Old Harbor, which is crossed by two bridges, is 1 mile long from the entrance to the railway bridge, and 350 feet wide, with depths of 19 to 22 feet between the lighthouse and the western bridge, and of 23 to 24 feet (to be dredged to 24 feet) in the approach to it, which is also a fairway to the Winter Harbor.

The outer part of the Old Harbor, westward of the bridges, is for the use of large vessels, and is lined with massive quays. The part between the bridges is for the coasting traffic, and the part eastward of the railway bridge is only for timber traffic and the discharge of vessels laden with stone from Libau Lake. The quays on both sides of the harbor are furnished with railway lines in connection with the railroad. On the quays are two steam cranes with a lifting power of 20 and 25 tons respectively.

Target practice occasionally takes place from the port, the target buoys being laid out at the distance of 7,000 feet northwest from the northern entrance. Vessels firing at the target display, at the mast, a red flag by day and a red light by night, and the firing will be carried out in the direction of the northwest quarter. Each pair of buoys is connected by a steel rope.

Ice.—The port of Libau is now officially regarded as open all the year round for all vessels.

Water level.—There is no tide at Libau, but the water level varies about 3 feet, owing to wind; it is reported to fall from 2 to 4 feet below the level to which soundings have been reduced. West-erly winds cause a high, easterly winds a low level. There is some-times a swell in the channel after continuous bad weather.

Directions.—The approach to Libau presents no difficulty in clear weather, as the high factory chimneys and towers of the place are visible at a considerable distance, and a lightvessel lies $3\frac{3}{4}$ miles from the middle entrance to the port. When approaching in thick weather the lead should be frequently used and the water not shoaled to less than 10 fathoms until the lightvessel is made out. From the lightvessel the range beacons on the eastern side of Port Emperor Alexander III, in line bearing 68° lead through the center of the dredged channel, and through the middle entrance to the port. Vessels using this channel must keep strictly to the leading line.

Merchant vessels use the southern entrance, on the south side of the approach to which there is a bank of 21 to 23 feet, on which there is a rock with a least depth of 19 feet over it from which the southern lighthouse of the south entrance bears 66° distant 600 yards, and inside the entrance, in which the depth is 27 feet, there is a shoal of 18 feet on the north side. They must not enter at night, and a vessel attempting to do so is in danger of being fired on by the guardship.

Libau, the most important commercial town of Kourland, lies at the outlet of Lake Libau, on the narrow, low strip of land between that lake and the sea. It contains about 100,000 inhabitants, most of whom are Germans, the working classes are Letts, and the officials and garrison Russians.

There are several conspicuous buildings and two high church steeples visible from a considerable distance seaward. Libau is essentially a grain and timber exporting port. The principal industries are wire, nails, iron and steel, wagon works, oil mills, rope making, and there is a dockyard. Southward of the harbor, on the beach, are the baths and Kursal, the latter being massive and conspicuous. The space between the beach and the town is occupied by numerous villas.

Docks.—See Appendix I.

Repairs.—Large repairs can be made to machinery by a private firm, also repairs to hull. There are three floating cranes, which will lift 42, 25, and 15 tons, respectively. Cylinders of 52 inches can be cast and bored, boilers of any size can be made or repaired, shafts 15 feet long and 18 inches diameter can be forged and turned, 7-inch pipes can be brazed, masts made, and boats built.

Trade.—The chief articles of export are grain, cordage, hemp, flax, timber, eggs, spirits, wool, bone charcoal, oil cake, veneers, and hides; the principal importations consist of coal and coke, colors, herrings, iron, machinery, seeds, bricks, wine, salt, and chemical manures.

Supplies are procurable at moderate prices. The inhabitants get drinking water from a fountain near the Roman Catholic Church.

Coal can be obtained; about 42,500 tons are imported annually for government use.

Life-saving.—There is a lifeboat and rocket station near the lighthouse.

Storm signals are made at the pilot tower.

Communication.—There is railway communication between Libau, Riga, and Petrograd, via Wilna.

There are regular lines of steamers between Libau, Belgium, Holland, England, and the principal Baltic ports.

Telegraph.—A submarine cable is laid between Libau and Bornholm.

Radio station.—There is a radio station at Libau, available to the general public from 6 a. m. to 10 p. m., standard time; call letters R. O. L.

Time signal.—On the flagstaff at the Marine Telegraph Station a ball is dropped by hand, daily, at noon, standard (Pulkowa) mean time, corresponding to 21h. 58m. 41.4s., Greenwich Mean Time; a gun is fired simultaneously. The ball is hoisted 10 minutes before the signal; it consists of two vertical intersecting disks, 2 feet 5 inches in diameter, and its height is 132 feet above the sea and 110 feet above the ground.

The Marine Telegraph Station is situated 620 yards 228° from the Naval Church.

On special permission being obtained from the harbor master, a comparison may be obtained at the Naval Chart and Chronometer office in the Military port, from an electric clock.

Libau Lake, which is connected with Tosmar Lake, about 1½ miles northward of it, is 8 miles long, 1½ miles wide, and navigable for craft drawing 3 feet. Its banks are mostly marshy except in the neighborhood of the town, where they are composed of gravel and sand. At the entrance to the canal are some small low islands, with buildings on them. The water is generally fresh, but westerly winds frequently drive the salt water into the lake; the current running out occasionally attains a rate of 2 knots.

Spoil ground.—The depth over the former spoil ground northward of Libau, situated 1.6 miles 12° from the North Molehead Light, has been decreased by material discharged by the dredger to a depth of 2¼ fathoms. A new spoil ground has therefore been established, and is marked on its west side by two black and white spar buoys, each with two black brooms, bases together, moored nearly 1½ miles apart on a bearing 0° true from the northern end of the northern detached breakwater, the southern buoy being 1,280 yards distant from that point.

Stein Ort—Danger—Buoys.—Stein Ort, situated 19 miles northward of Libau, has about 1¼ miles 324° from the lighthouse, and on the extremity of the foul ground extending from it, a rock with 8 feet water. On the northwestern side of this rock, in a depth of 6

fathoms, there are two black and white spar buoys, each surmounted by two black brooms, bases together.

Light.—An alternating flashing white and red light, elevated 118 feet above the sea, is exhibited from a circular stone tower, upper part yellow, lower part red, on octagonal base, 115 feet high, on Stein Ort. Telephone station. (For details see Light List.)

Life-saving.—A lifeboat is stationed at Stein Ort, and there is a life-saving station near Saraiken Church 10 miles southward.

Pawlowsk Harbor, about 5 miles northeastward of Stein Ort, is formed by the mouth of the Sakenhausen River, and protected by moles extending from the north and south banks. The depth on the bar is 7 to 8 feet, and in the harbor 11 feet, but is liable to change in stormy weather. The chimney of a distillery, situated about 1½ miles southeastward of the harbor, serves as a landmark.

Fishing lights.—Two fixed white lights, vertical, 3 feet apart, are shown at an elevation of 28 feet on the north mole of Pawlowsk Harbor.

Life-saving.—There is a lifeboat at Pawlowsk Harbor, and also one 8 miles farther northeastward, near the village Labragen. Near Dizniak, 4 miles northeastward of Labragen, there is a rocket station.

Backofen Light.—On Backofen Hill, 25½ miles northeastward from Stein Ort, stands a circular red tower over a dwelling 59 feet high, from which 160 feet above the sea is exhibited a group flashing white light. (For details see Light List.) Sketch on charts 2372, 2842b.

Shoals.—Two detached patches of 4½ fathoms lie about 1½ miles from the shore about 3¼ miles northward of Backofen Light.

A depth of 6 fathoms is situated about 2 miles offshore, 5¼ miles to the northward of Backofen Light.

Life-saving.—About 2 miles northward of Backofen Lighthouse there is a lifeboat and rocket station near Kangrosem.

Windau.—About 12 miles north-northeastward of Backofen Lighthouse (with the intervening coast projecting out to the distance of 1½ miles) lies Windau Harbor and River, the entrance to both of which lies between two long moles extending out a mile from the coast.

Landmarks.—The town can be seen from a considerable distance seaward, and may be recognized by the tall spire of the Lutheran Church, and several windmills; on a nearer approach the pilots tower at the south entrance point of the river, a white stone quadrangular structure surmounted with a white flagstaff and yard, will be seen, with its summit elevated 96 feet above the sea.

Harbor.—Windau Harbor consists of an outer and inner harbor. The outer harbor is formed by the north and south moles.

The south mole is about 1,600 yards long in a northwest direction, curving a little to the northward; the north mole, starting from the shore about 1,200 yards northeastward of the river's mouth, projects about 1.1 miles in a west-northwest direction, curving slightly to the westward. Further works are contemplated in the northern part of the inclosed area. The width of the entrance is about 375 yards between the moleheads.

The dredged channel to the river lies between the south mole and a line joining the end of the new north mole to the head of the short inner mole at the north side of the river entrance.

The inner harbor is above the mouth of the river, and is about 100 yards wide in the entrance and nearly 200 yards wide abreast the town.

There is a spacious quay, 3,800 feet long, on the north bank of the river opposite the town, furnished with an elevator and all modern improvements, including a refrigerator, and with the railway running down to the long series of commodious warehouses. There is a depth of 8 to 25 feet alongside the quay.

On the south side is the town, with extensive quays; that between the old Winter Harbor and the castle is used by vessels from abroad when clearing the customhouse, and also by loaded vessels awaiting fine weather in order to leave. Between the castle and the customhouse vessels discharge and load cargoes other than timber, which is loaded on the north bank below the bridge, and at the timber yards on both banks above the bridge. On the customhouse quay is an electric crane to lift 45 tons. On the left bank of the river above the bridge are 10 dolphins for mooring purposes.

The banks of the river are steep; vessels drawing 18 to 21 feet can lie alongside the quays on the south side. The banks above the bridge are in their natural condition, except on the right bank, where there is an embankment, and where dredging has been carried on. On the south side, about 1,800 yards from the entrance, is the Winter Harbor, with a depth of 13 feet.

Buoys.—The dredged channel through the outer harbor is marked on its northern side by red spar buoys with upturned brooms, and on its south side by white spar buoys with downturned brooms.

Navigable depths.—The depth in the dredged channel is permanently maintained at not less than 25 feet for a width of about 140 yards. In the river the general depth is 18 to 39 feet below the bridge, as charted, there being not less than 25 feet in the fairway.

Dredging operations are being carried on to meet the requirements of the timber trade, and vessels drawing up to 21 feet can reach the timber yards above the bridge.

In the spring, when ice is in motion, the water level is mostly 4 to 5 feet higher than usual; it may, however, be $6\frac{1}{2}$ feet higher. With

onshore gales the water rises 2 to 3 feet; the lowest level is 2 feet below the ordinary. The current occasionally runs $2\frac{1}{2}$ knots out of the river.

Lights.—On the outer extremity of the North Mole of the outer harbor, a flashing red light, elevated 49 feet above the sea, and visible 12 miles, is exhibited from a red circular iron tower, 31 feet high. (See Light List.)

On the outer extremity of the South Mole a flashing white light, elevated 49 feet above the sea, and visible 12 miles, is exhibited from a white circular iron tower, 31 feet high. (See Light List.)

A fixed green light, elevated 22 feet above the sea, is exhibited from a light green building on the head of the old South Mole, at the entrance to the inner harbor. (For sector, see Light List.)

From a framework on masonry base standing east-southeastward of the last light, and about 70 yards northward of the pilots' tower, near the inner end of the southern mole, a fixed green light is exhibited at an elevation of 44 feet above the sea.

A fixed red light is exhibited from a red iron building on the extremity of the inner mole on the northern side of the entrance to the river, at an elevation of 22 feet above the sea.

A fixed red light, elevated 18 feet above the sea, is shown from a white wooden column, 12 feet high, situated near the angle at the eastern end of Gertzogskaya Quay, on the northern side of the river, opposite the Fish Harbor.

Fog signal.—A fog bell is established near the lighthouse on the head of the south mole, at the entrance to the outer harbor.

Ice.—The river generally freezes over at the end of November, and thaws in the second half of March; the lower part of the harbor, from the bridge to the entrance, is kept open during this time by an ice breaker, so that steamers can enter and leave throughout the year.

Signals.—There is a signal station at Windau, on the pilots' tower, where International Code Signals are made; storm signals are also exhibited here.

Signals for entering, and depth, when the pilot is unable to go out, are made at the directing beacon near the pilots' tower.

Windau Roads.—The best anchorage is westward of the town, from $2\frac{1}{2}$ to 4 miles from the shore, in 8 to 10 fathoms.

Pilots.—The pilots meet vessels outside the moles. If the pilot is unable to get on board, the vessel entering is directed by signals from the directing beacon. The rate of pilotage is 3 copecks per net register ton below the bridge and 4 copecks above.

Directions.—Approaching Windau due allowance must be made for current, which always sets along the coast northward or southward, and may reach a velocity of 2 knots, and if from the south-

ward keep about 3 miles from the shore, until the northernmost windmill at Windau, the castle, and other buildings are seen clear of the forest; if from the northward keep about 5 miles from the shore until the town bears about 139° , when the road or harbor entrance may be steered for. The pilots' tower bearing 143° leads to the entrance between the North and South Moles, where the set of the current must be attended to; in entering the river great care, however, is necessary at times, owing to the strong current setting out of the river. A stranger should employ a pilot for entering, but for leaving one is not necessary.

The town of Windau, with about 15,000 inhabitants, lies on the southern side of the entrance to the Windau River. The most conspicuous public buildings are a Lutheran and an Orthodox Church, a Roman Catholic Chapel, two synagogues, and the castle situated on a height. The principal industries are sawmills, rope making, and glass works. There are sea baths on both sides of the river. The town and quays on both sides of the river are lighted by electricity. A railway bridge over the river is being constructed to connect the town with the railway depot.

Life-saving.—A lifeboat and rocket apparatus are stationed at Windau.

Trade.—The imports consist chiefly of coal, cotton, machines, petroleum, salt, superphosphates, lead, and herrings; and the exports of butter, flax, hemp, grain, tow, and timber.

Supplies.—Provisions can be procured at moderate prices. Indifferent drinking water is found in wells in the town; the river water is clear and palatable except after a continuance of westerly winds, when it is not fit for use. There is a spring of fresh water in a small bight on the north bank.

Coal.—Vessels may obtain coal alongside the town quay, where there is a depth of 18 to 20 feet. Small quantities are kept in stock. About 15,000 tons were imported in 1911, mostly from the United Kingdom.

Repairs.—Small repairs can be executed to hull and machinery by a private establishment.

Tugs can be obtained.

Communication.—There is an electric telegraph station at Windau; and a railway to Riga and Moscow, and thence with the whole of Russia. There is communication by steamer with Petrograd (St. Petersburg), Revel, Riga, and Libau. Lines also run once a week to London, Leith, Stettin, and Copenhagen, fortnightly to Hamburg and Hull, and once a week to Stockholm.

Fishing light.—A fixed white light, elevated 30 feet above the sea and 14 feet above the ground, is shown from the shore near

Stalzen Village, 3 miles northward of Windau, from September to January, when the fishermen are out.

Lyser Ort, situated 11 miles north-northeastward from Windau, is a low, sandy point, and from seaward has a whitish appearance. Close to Lyser Ort the coast is foul, and 3 to 4 miles south and west of it there are several shoals with depths of $3\frac{1}{2}$ to 5 fathoms.

Light.—On Lyser Ort, about 700 yards inshore, stands a white circular stone tower, 111 feet high, from which, 118 feet above the sea, is exhibited a fixed white light, visible 16 miles; shown during the whole of the navigable season. (For sector see Light List.) See Ice signals.

Ice signals.—While ice is seen in the Gulf of Riga from neighboring lighthouses, a black ball is hoisted by day upon a flag-staff on the gallery of Lyser Ort Lighthouse, and during the night, the fixed white light is changed in color to red.

Fog signal.—A siren, worked by compressed air, is sounded in thick or foggy weather. It is situated about $\frac{1}{2}$ mile to the northeastward of the lighthouse. (See Light List.)

Signal station.—There is a semaphore and telegraph station at Lyser Ort Lighthouse, where International Code Signals are taken in; telephone to Michael Lighthouse.

Lyser Ort Reef, within the 5-fathom curve, extends 5 miles in a northwest direction from Lyser Ort, and has a least depth of 2 fathoms, with $4\frac{1}{2}$ fathoms at its outer extreme.

From the outer of the two shoalest parts of this reef Lyser Ort Lighthouse bears 138° distant $4\frac{1}{2}$ miles; this forms part of a 3-fathom patch about a mile long in a north and south direction. The channel between this patch and the shore is encumbered with shoals. The reef for about 3 miles from its northern extreme is covered by a sector of flashing white light from Michael Lighthouse.

Buoys.—The western edge of Lyser Ort Reef is marked by three black and white spar buoys, surmounted by two black brooms, with bases toward each other, placed about 1,200 and 1,800 yards apart. Two white spar buoys, each with one black down-turned broom, mark the northern edge of the reef, and a red and white spar buoy with two red brooms, bases apart, is moored in 5 fathoms eastward of the northern part of the 3-fathom patch above mentioned.

A red and white spar buoy with two brooms, bases apart, is moored about 800 yards eastward of an inner 2-fathom depth, which lies 3.2 miles northwestward of Lyser Ort Lighthouse.

Light vessel.—An alternating fixed and flashing light, elevated 56 feet and visible 13 miles, is exhibited from a light vessel moored in $10\frac{3}{4}$ fathoms, sand, about $\frac{3}{4}$ mile northwestward of the northern extreme of Lyser Ort Reef. (For details see Light List.)

Signals by means of flags and rockets are made to warn vessels seen standing into danger.

The light vessel has two masts and a black funnel, with a red ball at the mainmast head; hull is painted red with a broad white horizontal band, and is marked "Иосепопрскій" on both sides.

The light vessel will be withdrawn when ice sets in.

Fog signal.—In thick or foggy weather a siren is sounded. Should the siren be disabled, the vessel's bell will be sounded. (See Light List.)

Submarine bell.—A submarine bell is also sounded on the light vessel off Lyser Ort Reef. (See Light List.)

Span (Spon) Bank, with depths of 5 and 6 fathoms upon it, and 30 to 37 fathoms close around, is $2\frac{1}{2}$ miles long northeast and southwest, and $\frac{3}{4}$ mile broad; from the center and shoalest part of this bank Lyser Ort Lighthouse bears 80° , distant 19 miles.

A shoal about $1\frac{1}{2}$ miles long north and south, with depths of $4\frac{3}{4}$ and 6 fathoms on it, and deep water around, lies $1\frac{1}{2}$ miles south-southeastward of Span Bank. From the shoalest spot, $4\frac{3}{4}$ fathoms, on the southern part of the bank, Lyser Ort Lighthouse bears 70° , distant $18\frac{3}{4}$ miles.

Lyser Ort Flat, situated 13 miles northwestward of Lyser Ort, is about 6 miles long north and south and 3 miles broad, with depths of 6 to 9 fathoms and 12 to 19 fathoms close around.

About 9 miles westward of Lyser Ort Flat there is a bank named Apollon, with 8 fathoms least water and 22 to 39 fathoms close around.

Vinkova Flat is an extension of Lyser Ort Flat to the southward for about $3\frac{1}{2}$ miles, with an extreme breadth of $5\frac{1}{2}$ miles; it has general depths of 6 to 10 fathoms, but a small shoal of $4\frac{1}{4}$ fathoms has been found on its eastern part. The position is doubtful.

The northwestern side of this shoal head is marked with a white spar buoy surmounted by a black down-turned broom; and its southeastern side by a red spar buoy with up-turned broom.

Michael Banks, situated $7\frac{1}{2}$ miles northward of Lyser Ort, and in the fairway of the south channel leading to the Gulf of Riga, are about 4 miles in extent north and south; the southernmost and largest is $2\frac{3}{4}$ miles long east and west and about $\frac{1}{2}$ mile broad, with a depth of 3 to 5 fathoms and 7 to 9 fathoms close around; from the shoalest part of this bank Lyser Ort Lighthouse bears 183° , distant 7.7 miles. The middle bank is covered with a least depth of 3 fathoms and the northernmost bank with $2\frac{1}{4}$ fathoms. The banks are covered by a sector of flashing white light from Michael Lighthouse.

Ignateva, with a depth of $4\frac{1}{4}$ fathoms on it, lies southward of Michael Bank and about 1 mile southward from it is the northern

patch of the Tschainakova, which has a depth of $4\frac{1}{2}$ fathoms; a shoal with a depth of $4\frac{1}{2}$ fathoms lies 1,600 yards westward from northern Tschainakova. Over these shoals Michael Light shows fixed white.

Petropaulosk Bank, with $3\frac{1}{2}$ fathoms, rock, lies 2 miles northwestward of Michael Bank and 10 miles, 344° , from Lyser Ort Lighthouse. About $1\frac{1}{2}$ miles eastward of this bank there is a shoal with a depth of $4\frac{1}{2}$ fathoms and 7 fathoms close around, and $\frac{3}{4}$ mile northwestward there is a shoal with $4\frac{1}{2}$ fathoms. These shoals are within the sector of light covering Michael Banks.

Buoys.—The western side of the above shoals, considered as one danger, is marked by six black and white spar buoys, each surmounted by two black brooms, bases turned toward each other; the most northern and southern of these buoys have, in addition, a black and white ball under the brooms.

The northernmost of the above buoys is moored 1 mile west-northwestward from Petropaulosk Bank, the southernmost lies off the western edge of the Tschainakova group of shoals; the intermediate buoys are in line 152° between the above at equal distances of about 1 mile.

A red spar buoy, surmounted by a red broom, turned upward, is moored $\frac{1}{2}$ mile southward of the southern Tschainakova Shoal.

The southeastern side of the shoal, considered as one danger, is marked by four red and white spar buoys, each surmounted by two red brooms turned from each other. These buoys are moored in a line extending about 40° from the buoy southward of Tschainakova Shoal and are at a distance of about 1 mile from each other.

Wreck—Light buoy.—A red light buoy, showing a flashing white light every 3 seconds, is moored southwestward of the wreck of the steamship *Hans Wogalsky* (*Wogatsky*) (1910). $5\frac{1}{2}$ miles 341° from Lyser Ort Lighthouse. In 1910 the depth over the hull of the wreck was $6\frac{1}{2}$ fathoms, but the masts were only about 1 fathom below the surface of the water. A broom buoy is also moored on the northern and western sides of the wreck.

About 1,800 yards west-southwestward and 1 mile southeastward of the wreck are patches of 5 fathoms.

The channel between Lyser Ort Reef and Michael Banks is $4\frac{1}{2}$ miles wide. About midway between Lyser Ort and Michael Lighthouses several shoals, with depths of $2\frac{1}{2}$ to 4 fathoms, extend $3\frac{1}{2}$ miles from the shore: the outermost rocky shoal, with 4 fathoms water, lies with Lyser Ort Lighthouse bearing 210° , distant nearly 6 miles.

About $\frac{1}{2}$ mile west-northwestward of the outer shoal there are moored two white spar buoys surmounted by black crosses under down-turned brooms.

The channel northeastward of Michael Banks is about 2 miles wide; on the northeastern side of this channel there are several shoals.

the westernmost, named Beresina Bank, with a depth of $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, is about $1\frac{1}{2}$ miles long north-northeast and south-southwest, and $\frac{1}{2}$ mile broad, and is situated $13\frac{3}{4}$ miles 6° from Lyser Ort Lighthouse. It is marked by three spar buoys; that northward is white with black down-turned broom; westward, white and black with two black brooms, bases turned toward each other; and southward, red, with upturned broom. Rabotnik Bank, with a depth of 18 feet, lies $1\frac{1}{4}$ miles eastward of Beresina.

Olaf Bank, with $2\frac{1}{4}$ to 3 fathoms water, lies about $1\frac{1}{4}$ miles east-southeastward of Rabotnik Bank; its northeastern side is marked by a white and red spar buoy with two red brooms, bases turned from each other, its southwestern end by a red spar buoy with upturned broom, and its northern side by a white spar buoy surmounted by a black down-turned broom.

About $2\frac{1}{4}$ miles southeastward of Olaf Bank there is a shoal named Ivanov Bank $\frac{3}{4}$ mile long, east-northeast and west-southwest, and $\frac{1}{4}$ mile broad, with $2\frac{1}{2}$ fathoms least water and depths of $5\frac{1}{2}$ to 7 fathoms around, bottom small stones and sand. Its northern edge is marked by a white spar buoy with black down-turned broom, and its southwest side by a red spar buoy with upturned broom.

The coast between Lyser Ort and Domesness is low and bare, having in some parts sand hills of moderate height. Blue or Dome Berg, a range of hills 165 to 200 feet high, situated about 20 miles eastward of Lyser Ort, is about 5 miles long, east and west; on the western end of the range stands a cylindrical red stone tower 92 feet high and 280 feet above the sea, named Slitter (Shlitter) Beacon, which can be seen in clear weather from a distance of 22 miles seaward, and is a good mark for recognizing this part of the coast.

Michael Light.—From a white circular stone tower, 170 feet high, situated $8\frac{1}{4}$ miles eastward of Lyser Ort Lighthouse, is exhibited, 180 feet above the sea, a fixed, flashing, and group flashing white electric light, visible 20 miles.

The fixed light and the flashes are shown in sectors, for which see Light List.

Telephone station.

There is a landing stage at Michael Lighthouse, with 5 feet of water alongside. The approach is easy only with southerly winds, and when there is no swell. There is also a landing stage at Gross Irben, to the eastward.

Domesness and Reef.—Domesness, the northernmost point of Kourland, is moderately high. Domesness Reef, with 2 to 3 feet water, extends 3 miles in a northerly direction from the point and is steep-to on its north and east sides. It is marked by five spar buoys: a black and white buoy, with two black brooms, bases together, northwestward of the lighthouse; two white buoys, each

with a black down-turned broom, northeastward of the lighthouse; a red and white buoy, surmounted by a red and white ball under two red brooms, bases apart, 900 yards southeastward of the latter white buoys; and a red and white buoy, with two red brooms, bases apart, lying off the middle of the eastern side of the reef.

Light.—On an islet at the extremity of Domesness Keef stands a red circular tower 46 feet in height, from which, 64 feet above the sea, is exhibited a fixed and flashing white light visible 14 miles. (For details see **Light List**.)

Fog signal.—During thick and foggy weather a fog siren at Domesness is sounded.

Signal station.—There is a semaphore and telegraph station at Domesness Lighthouse, which is also connected with the shore by telephone.

There is a landing stage at the lighthouse, with a depth of 8 feet alongside; also at Domesness, with a depth of 8 to 12 feet.

Life-saving.—There is a lifeboat station at Gross Irben, $3\frac{1}{4}$ miles eastward of Michael Lighthouse, and at Klein Irben, 9 miles eastward of Gross Irben; a lifeboat and rocket station at Domesness, and a rocket apparatus at Domesness Lighthouse.

The Gulf of Riga is bounded on the south and west by the Kourland Shore, and on the east by Livonia, on the north by the islands Ösel, Dagö, and Möön, and is connected with the Gulf of Finland by Wormsö and Möön Sounds. The principal entrance from the Baltic lies between Lyser Ort and Ösel. The gulf is 92 miles long, north and south, and 55 miles wide on the parallel of Domesness, with depths of 20 to 27 fathoms, mud, in the middle, decreasing gradually toward the shores. The Dvina River, on which stands the ancient town Riga, empties itself into the southern part, and Pernau River into Pernau Bight, in the northeast part of the gulf.

The prevailing westerly winds cause a short, high sea in the gulf, and fogs are frequent, especially during the spring. The refraction is occasionally so great that distances can not be estimated.

Directions.—Vessels bound to the Gulf of Riga usually make the land about Windau, thence steer northward, keeping about 8 miles from the shore, or not shoaling into less than 13 fathoms. Lyser Ort Reef should not be approached nearer than to a depth of 10 fathoms, until Michael Lighthouse bears 105° , and Lyser Ort Lighthouse 137° ; or the Lyser Ort Lightvessel may be steered for on a northeasterly course, and having passed northward of it bring it eastern, bearing 263° , and steer 83° to pass between the southern Tschainakova Buoy and a 5-fathom patch southward of it. Having passed the buoy steer 70° , which leads northward of the shoal extending $3\frac{1}{4}$ miles from the shore, between Lyser Ort and Michael Lighthouse, and to a position about $1\frac{3}{4}$ miles northward of Domesness

Lighthouse. After passing Michael Bank, do not shoal into less than 10 fathoms toward the Kourland Coast; care is also necessary to avoid Dal Grund and adjacent shoals extending from Swalfer Ort.

During fine weather a vessel may pass through the channel north-eastward of Michael Bank by steering for Michael Lighthouse on a 143° bearing, until Lyser Ort Lighthouse bears 209° , when a 72° course may be steered, rounding Domesness at a distance of about 4 miles, thence a 137° course may be steered for Dvina River entrance.

Ice.—The middle of the gulf rarely freezes completely over. The southern entrance is usually closed for a few weeks, the earliest date of closing of which records exist is January 15. The northern entrance is also usually closed only for a short time, but this occurs earlier than in the southern entrance.

The Dvina River is kept open by icebreakers.

During the 14 years 1891–1904, the earliest date on which the gulf was closed by ice was January 15, 1891, and the latest March 24, 1898; but in the years 1893, 1897, 1900, and 1903 it was open throughout the winter. These dates apply only to the entrance to the gulf near Domesness. The Dvina River is kept open by ice breakers.

Current.—With west and southwest winds the accumulation of water in the Gulf of Riga is considerable, and the current extending as far as the eastern shore is diverted, and flows thence in a northwestward direction past Runö at the rate of 1 to $1\frac{1}{2}$ knots; when these winds cease the current runs out past Domesness and Lyser Ort. The current from the Gulf of Finland through Möön Sound, during a continuance of calms, attains a rate generally of $\frac{1}{2}$ to $\frac{3}{4}$ knot, and ceases between Runö and the coast of Livonia.

Between Lyser Ort and Swalfer Ort the current invariably sets to the westward out of the Gulf of Riga.

The coast from Domesness trends in a southeast and easterly direction 73 miles to the mouth of the Dvina River, and is generally low and sandy, with hills in places and wooded; thence in a northerly direction 80 miles to Pernau Bight.

There are no dangers beyond the distance of $1\frac{1}{2}$ miles from the shore between Domesness and Messaragotsein Point, 29 miles south-eastward of it. Vessels may anchor in depths of 10 to 15 fathoms, with offshore winds, abreast any part of this coast. The usual anchorage, however, is in 7 to 9 fathoms in Kapel Wik, southward of Domesness.

Roign Harbor Lights.—A fixed red light is shown from the northwestern end and a fixed green light from the southeastern end of the breakwater of Roign Harbor of Refuge, situated about $16\frac{1}{2}$ miles south-southeastward of Domesness. Both lights are elevated 28 feet above the sea, and are exhibited from black beacons in the

form of columns with lateral supports, with green lanterns. They are shown throughout the year, except from May 28 to July 28.

Messaragotsem Light.—On the northern side of Messaragotsem Point stands a white lighthouse, 54 feet in height, from which, 70 feet above the sea, is exhibited an alternating white and red light. Telephone station. (For details see Light List.)

There is a landing stage, with a depth of 4 feet at Messaragotsem Lighthouse; also at Gibkin, 19 miles to the northwestward, and at the canal leading to Anger Lake, to the southward.

Life-saving.—A lifeboat is stationed at Messaragotsem Point.

Messaragotsem — Rock reported.—The steamship *Georgi*, drawing 9 feet, is reported (1914) having struck a rock at a distance of about $\frac{1}{2}$ mile northeastward from Messaragotsem Point.

Shoals—Buoy.—Within the 5-fathom curve, as far as Berzetsem, a distance of $6\frac{1}{2}$ miles southward of Messaragotsem Point, shoals extend nearly 2 miles from the shore. About $2\frac{1}{2}$ miles 122° from Messaragotsem Point Light there is a rocky shoal with a depth of 2 fathoms, and $1\frac{3}{4}$ miles farther south is another shoal covered with only 1 fathom of water. A white and red spar buoy, with topmark of two red brooms with their bases turned apart, is moored in a depth of 7 fathoms, about a mile eastward of the northernmost of these shoals.

Runö, situated $19\frac{1}{2}$ miles eastward of Domesness, is 3 miles long north-northwest and south-southeast, and 2 miles broad; the western side is low, with foul ground extending nearly 2 miles from the shore; the eastern side hilly, rising to 92 feet, and wooded, with no dangers beyond $\frac{3}{4}$ mile. There is a landing stage on the eastern side of the island, 300 feet long, with 7 feet of water.

Buoys.—A shoal, with $1\frac{1}{4}$ fathoms least water, extends nearly $3\frac{1}{4}$ miles in a north-northwest direction from Runö and is marked at its northern extremity by two white spar buoys with black downturned brooms in a depth of 6 fathoms, also on the western side by a white and black spar buoy with broom topmark in 3 fathoms.

Light.—On Hochberg, southeastern side of Runö, stands a red circular lighthouse, 126 feet high, from which, 218 feet above the sea, a fixed white light is exhibited, visible 21 miles, shown during the navigable season. (See Light List.)

The upper half of the lighthouse only is visible above the trees.

Anchorage may be obtained on either side of Runö; the better, however, is on the eastern side abreast the lighthouse.

Radio station.—There is a radio station on Runö, open to the general public from 8 a. m. to noon, 2 to 5 p. m., and 8 to 9 p. m., Petrograd (St. Petersburg) time; call letters R R N.

Life-saving.—A lifeboat (whaleboat) is stationed at the southwestern side of Runö.

Greta Grund, situated on the southern side of Runö, is $3\frac{1}{4}$ miles long, north and south, and $1\frac{1}{4}$ miles broad, with general depths of $4\frac{1}{2}$ fathoms; on the northern part there are two rocky shoals, with only 8 and 9 feet water, distant from the island $2\frac{1}{4}$ and $2\frac{3}{4}$ miles, respectively. Between Greta Grund and the shoal extending from Runö there is a narrow channel with a depth of 15 to 19 fathoms.

A shoal, with a depth of $2\frac{1}{2}$ fathoms on it, lies $7\frac{1}{2}$ miles 160° from Runö Lighthouse. A red spar buoy, surmounted by a red upturned broom, is moored southward of the shoal.

The coast.—Between Berzetsem and Ragotsem Points, a distance of 17 miles, the shallow water does not extend far from the shore, except between Kestretsem and Plenitsem, where it runs off $1\frac{1}{2}$ miles; in the bay east of Ragotsem the 5-fathom curve is about 1 or $1\frac{1}{2}$ miles from the land. Tukum Heights or Huningsberg Hill, 367 feet high, situated about 9 miles westward of Ragotsem, is a good mark for recognizing this part of the coast.

The Mukha or Aa River, which flows parallel with the coast eastward of Ragotsem and terminates at the mouth of the Dvina, has broken through the narrow strip of low land a short distance westward of the Dvina; vessels drawing not more than 5 feet can enter the Mukha by this passage.

There are landing stages at Ragotsem and at Bilderlinshof, 12 miles eastward.

Life-saving.—Near Ragotsem a lifeboat is stationed; at Bulen, 15 miles eastward of it, there is a lifeboat and rocket station.

Storm signals are shown at Ragotsem Point, and at Kaurgerzem, $5\frac{1}{2}$ miles southeastward.

Dvina River.—The Dvina, before entering the sea, formerly separated into two arms, the eastern named the Old, and the western the New Dvina, which arms formed the islands Great and Little Magnusholm, separated by a narrow channel overgrown with reeds. The Old Dvina was closed by a dam 1,400 yards within its mouth, which part of the old channel has filled up, rendering this arm inaccessible from seaward.

The islands Great and Little Magnusholm are both low; the former has a few sandy elevations, but the latter is marshy. On the north-western end of Great Magnusholm is a battery from which the Magnusholm Dike extends seaward, with an iron lighthouse at the outer end, and in conjunction with the West Mole on the opposite side, protects the entrance to the river.

On the dike from which the West Mole projects are the main lighthouse and leading beacons.

Dünamund, with its fortress, is situated on the northeastern end of Dünamund Island, western side of Dvina River entrance; this island is formed by the Mukha, and connected with Bolder Aa by a wooden

floating bridge and by an iron railway bridge with a single line of rails.

The valley through which the river flows is composed partly of sand hills and partly of meadows or swamps, but of late much has been done toward draining the latter.

Within the river there are several low islands and sand banks partly covered with grass, but these and the low shores of the river, when the ice melts in the spring, are generally inundated. The construction of a canal to connect the waters of the Dvina with those of the Dnieper, thus forming a waterway between Riga and Khereson, at the mouth of the latter river, is under consideration.

Navigable depths.—The heaviest draft vessel that has visited Riga was of 21 feet draft (1890). The depth on the bar is maintained by dredging at 25 feet at ordinary water level. The channel between the bar and Riga has been dredged to a minimum depth of 22 feet, and there are depths of 20 to 24 feet at the various loading and discharging places.

Life-saving.—At the entrance of the Dvina River a lifeboat is stationed on the dike on the western side and a lifeboat and rocket apparatus on Magnusholm.

Signal station.—There is a signal and telegraph station at Ust Dvinski, on the western side of the entrance, where International Code signals are taken in.

Storm signals are shown from a mast on the western side of entrance at Ust Dvinski.

The roadstead is exposed to northerly winds, and, notwithstanding its moderate depth and good holding ground, is not without danger, especially during the autumn. On the shoals, which are steep-to, there is a heavy sea during northerly gales, and great difficulty would be experienced in clearing them. Vessels should, therefore, either proceed to sea or enter the river if a gale be expected from that quarter.

The best anchorage is in a depth of 10 to 11 fathoms, mud, 2 miles northwestward from Ust Dvinski Lighthouse. Vessels ought not to anchor closer in without a pilot, and when approaching the road during night should steer with the beacon lights in line bearing 142° and anchor in a convenient depth.

The bar of the Dvina extends over 1 mile from the shore, and the channel frequently changes in depth and direction, through strong currents, northerly gales, and drift ice. At the opening of navigation in 1900 the depths on the bar of the Dvina were reduced to 14 feet, owing to the material brought down by flood.

Westerly winds cause the water to rise 1 to 3 feet and strong easterly winds to fall 2 feet. As soon as the bar is free from ice

and the water which overflows the lowlands has receded and attained its normal level, the channel is carefully sounded and marked by buoys.

In spring the current from the river sets across the bar in a north-westerly direction, occasionally at a rate of 3 knots an hour, but during summer it is very weak.

Lights.—A fixed and flashing or alternating fixed and flashing light, depending on the depth of water on the bar, is exhibited 103 feet above the sea, from a white circular iron tower, 93 feet high, at Ust Dvinski, on Fort Kametski Mole, western side of the entrance to the West Dvina; the light is shown during the navigable season. (For details, see Light List.)

At the northwestern extremity of Magnusholm Dike, on eastern side of entrance, from a red circular iron tower, with dwelling attached, there is exhibited, 26 feet above the sea, a fixed green light. The light is shown during the navigable season. (For sector, see Light List.)

Range lights are exhibited from red iron framework beacons, about 500 yards apart, and 18 and 46 feet high, respectively, the rear beacon having a white spot in the middle, situated on the above-mentioned western mole, near the Ust Dvinski Lighthouse.

Both the front and rear beacons carry two lights, a flashing white over a fixed red light, the front upper light elevated 30, and the rear upper light 54 feet above the sea. When in line, bearing 142° , they lead through the bar channel. Not shown unless depth on bar exceeds 12 feet, or when the bar from any cause is impracticable.

The following unwatched lights (each at the height of 27 feet) are also exhibited within the entrance of the river: At Dünamund Harbor, eastern side of north and south entrances, a fixed blue light; at the northern end of Malo (Little) Ilkenesh a fixed green light; and at the extremity of Shusterholm a fixed blue and red light; fixed red lights are shown at the ends of the dikes extending southward from Fogleholm and Ferdeholm, at the entrance to the Red Dvina river; and a fixed green temporary light, elevated 18 feet, and visible 2 miles, is shown on the eastern side of the entrance to the Red Dvina, about 800 yards eastward of the Ferdeholm Light.

Light and bell buoy.—A red light and bell buoy, exhibiting a fixed red light, lies 1.9 miles 320° from Ust Dvinski Lighthouse, and about 900 yards outside the bar; it is about 150 yards westward of the line of range beacons. In winter it is replaced by a large red spar buoy with upturned broom.

Bell buoy.—A red bell buoy, with broom topmark, lies nearly 1.6 miles 321° from Ust Dvinski Lighthouse, outside the bar and westward of the line of range beacons.

Bar Channel Buoys.—The Bar Channel is marked by three white iron buoys and five pairs of spar buoys on the west, and by the same number of red buoys on the east, side.

The river channel is stated to be marked throughout its whole length by spar buoys, white on the west, and red on the east, side.

Depth signals.—The following night tidal signals are given by the leading lights in connection with the white light of the principal lighthouse:

When the depth of water on the bar of the Dvina River is 18 feet and above, the principal lighthouse shows a fixed and flashing white light with the leading range lights exhibited.

When the depth of water on the bar is less than 18 feet and more than 12 feet, the Usk Dvinski Light will show alternating fixed and flashing, and the leading lights are exhibited.

When the depth of water on the bar is 12 feet or less, or if from any cause the bar or channel is impracticable, the light of the principal lighthouse shows alternating fixed and flashing, and the range lights are not exhibited.

Depth signals by day are made by the International Code hoisted on a signal mast near the lighthouse; the direction of the current is also signaled.

Bar signals.—Should the sea be too heavy for pilots to board outside the bar, the Russian merchant ensign will be hoisted north-westward of the northern range beacon, and inclined right or left, according as the vessel is to steer, or be kept erect when she is proceeding in the right direction.

When the flag is struck the vessel can not enter, but must anchor in the road, or keep at a distance from the shore.

These signals must be strictly observed, but it is recommended not to cross the bar without the assistance of a pilot.

Anchorage.—The best anchorage is between Great Magnusholm and the White Church which stands on the east bank about $2\frac{1}{2}$ miles within the river entrance.

Vessels are forbidden to anchor near a line 45° – 225° from the rear range light.

In Poder Aa, between Bolder Aa and Riga, vessels usually discharge their ballast.

Pilots for crossing the bar keep a lookout near the lighthouse at Ust Dvinski, and meet vessels outside the buoys; should, however, the weather prevent their proceeding out, and it is preferred not to enter by the signals from the beacon, vessels should lie to at a convenient distance from the shore. During stormy weather the pilot generally boards abreast the lighthouse on the eastern molehead (which can be passed tolerably close) and conducts the vessel to the anchorage at Bolder Aa, where a district pilot will be received; the customhouse

officers also visit the vessel here and deliver a notice of the harbor regulations of Riga, which have to be strictly observed.

Pilotage is compulsory for merchant vessels.

Pilot stations are at Bolder Aa and Riga.

Steam tugs, to tow vessels over the bar and up the river, can be obtained at Dünamund.

Ice.—The navigational period for the Port of Riga is now recognized to be as follows:

For all seagoing steam vessels, from April 14 to January 14. For all seagoing sailing vessels, from April 14 to November 14. River craft (from the bridge to the mouth of West Dvina), all the year round. River craft (above the bridge in Lake Shtint and the Aa River, April 14 to October 14.

Ice breakers are used in the Dvina River.

Dünamund Harbor, on the western side of the entrance to the Dvina, lies $6\frac{1}{2}$ miles below Riga, and is the outer port of that place. Dünamund Harbor proper is a long basin northward of the fort, inclosed by two moles, and has a depth of 22 feet. The western mole is connected with the fort by a bridge; the eastern mole is about 880 yards long, and is wider than the western; on the eastern mole is an elevator. The Winter Harbor, a large basin, lies on the western side of the above harbor; the southern part is shallow, but in the northern part the depth is from 12 to 17 feet. It is very liable to silt up, which entails constant dredging. The Winter Harbor is connected with the outer harbor by a passage between the moles on the east side; it can accommodate 300 vessels for wintering. On both sides of the harbor are loading and discharging places, also large warehouses and granaries, connected with Riga by railway. Both cranes on the quay can lift 20 tons. In the Winter Harbor are two floating docks and a patent slip. (See Appendix I.) Tugs are available.

Dünamund is a post and telegraph station. There is a telephone station at the pilot office.

Myulgraben.—About 4 miles from the river entrance, on the right bank, an arm branches off, leading to Lake Shtint. On the northern side of this arm lies the town of Myulgraben, with an extensive harbor with wooden quays for loading and discharging, and warehouses; it is connected by railway with Riga. The depth in the harbor is 18 to 30 feet, and it is much used by large steamers and by the vessels of the Russian Navy. It is used chiefly for the import of coal, iron, and rails, and the export of naphtha, kerosene, and mineral oil.

When ice begins to form, which is generally about the beginning of November, vessels take refuge in Myulgraben, where the water remains longer open. Should, however, the river be frozen in this

part, vessels arriving can not proceed beyond Bolder Åa, where there are quays and convenient places for loading and discharging. Vessels drawing above 22 feet must lighten.

Riga Harbor.—There are wooden quays on the banks of the river at Riga, and a massive stone quay at Andreasdam. The quays have railway lines laid on them.

A floating bridge connects the city with the suburb of Mitau on the left bank; it is removed in winter on account of ice. In the middle a higher part rests on two pontoons to afford free passage for rafts; on each side of the pontoon opening is a passage for vessels, opened at certain times of the day. Below the bridge is a floating pontoon for loading and discharging. Improvements are to be made in Riga Harbor. Dredging is in progress in various parts of the harbor and at the entrance to the river. The port is eventually to be dredged to a depth of 30 feet.

An iron railway bridge, 815 yards in length, crosses the river about 400 yards above the floating bridge, resting on 8 masonry piers. It is about 11 feet above the mean level of the water, and can be swung open near the right bank, giving a passage 65 yards wide. In winter, when the ice on the river does not bear, the traffic is carried over the railway bridge on each side of the rails. For foot passengers separate paths are attached to the bridge.

The chief customhouse and warehouses are at the town, with branch offices at Bolder Åa and New Myulgraben. Vessels must clear inward as well as outward at Bolder Åa. Bound inward they must anchor, but outward they can get cleared in passing against a moderate charge.

Riga, the capital of Livonia, and the second commercial Russian city of the Baltic, stands on the eastern bank of the Dvina River, which empties itself into the southern part of the Gulf of Riga. The city contains several handsome public buildings, and is richly endowed with charitable institutions, many of which are of ancient foundation. The population in 1913 consisted of about 558,000, the majority of whom are German Lutherans; Russians are next in numerical importance; there are also many Letts and Poles. The old part of the town has on the north and east, and separated from it by a canal with several bridges, the suburb of Petersburg, and on the south the suburb of Moskova, while opposite the town on the left bank of the river, is the suburb of Mitau. Of the several churches in the town St. Peters has the highest spire in Russia, namely, 469 feet. On the western side of the river, abreast Riga, lies an island named Kükersholm, on the northern extremity of which stands the Sailors' Home.

The chief industries in Riga are iron, steel, steam and electrical machinery, railway wagons, textiles, india-rubber goods, cotton yarn

and thread, linen yarn and cloth, paper, leather goods, chemicals, cement, sawmills, oil mills, breweries, and distilleries.

Communication.—Riga has regular communication by steamer to Petrograd (St. Petersburg), Revel, Arensburg, Pernau, Windau, Libau, Stettin, Lubeck, London, Hull, Leith, and Belfast.

It is connected by railways to Petrograd (St. Petersburg) (via Dünaberg), Mitau, Libau, and Tukum Hill, with branch lines to Dünamund and Myulgraben. There is a telegraph station.

Time signal.—On the roof of the Sailors' Home at Riga a black ball is hoisted half-mast, as preparatory, 15 minutes before the signal, close up at 5 minutes before, and dropped at 1h. 0m. 0s. Standard mean time, equivalent to 22h. 58m. 41.4s. Greenwich mean time. The ball is 5 feet in diameter, 121 feet above the water, 108 feet above the ground, and has a drop of 15 feet.

When the signal fails in accuracy a red flag is hoisted at the mast-head during the following hour.

Approximate position of time signal, latitude 56° 56' 52" north, longitude 24° 5' 30" east.

Storm signals are shown from a mast on the left bank of the river opposite Riga, near the navigation school.

Radio station.—A radio station, open to the general public, has been established at Riga; call letters R.R.G. Open from 6 a. m. to 10 p. m. Petrograd (St. Petersburg) time (2 hours in advance of Greenwich). The service is reserved to Gulf of Riga.

Radio storm signals.—See Chapter I.

Coal.—Steamers may be coaled alongside a wharf at Riga, where there is a depth of 21 feet; and at Myulgraben and Bolder Aa, where the depths are 25 to 26 feet. About 215,000 tons of coal are imported annually and about 26,200 tons are kept in stock by four firms; coaling can be performed by lighters holding 150 tons in bulk.

Supplies.—Fresh provisions may be obtained, as well as ship's supplies of all kinds. Water is obtained by hose at quay or from tank boats.

Docks and Patent slip, see Appendix I.

Repairs.—General repairs to hull, boilers, and machinery, can be executed by three firms, who build small vessels and engines. Cylinders of 60 inches diameter can be cast and bored; boilers of any size can be made or repaired; shafts 22 feet long and 10 inches in diameter can be forged and turned; boats can be built. There are sheers that will lift 24 tons, with a depth of 12 feet under them.

Trade.—The principal imports consist of coal and coke, copra, cocoa, chalk, bricks, cotton, corkwood, iron and steel, machinery, coffee, tea, rice, herrings, dyewood, india rubber, hides, and chemical manure. The exports are butter, cereals, hemp, flax, linseed, oil cake, skins and hides, eggs, game and poultry, hair, and wood of all kinds.

The Livonia Coast, from the Dvina River entrance, trends in a northeasterly direction $17\frac{1}{2}$ miles to Peter Chapel, near the small town Pabash Manor, thence in a northerly direction 53 miles to Pernau Bight. Along the coast there are numerous villages, and about 9 miles northeastward of the Dvina lies a small river, the Aa, with a depth of 3 feet in the entrance, but within there are 12 to 15 feet of water; it is a good landing place for boats. The coast, as far as Sophien Ruh Farm. 15 miles northward of Peter Chapel, is moderately high and lined with sand hills, some of which are wooded.

The coast from Sophien Ruh Farm to Dreimansdorf, 24 miles to the northward, is low and sandy, with a few mounds about 20 feet high a short distance inland. There are no outlying dangers from the Dvina to Dingen-Knan Point, 2 miles north of Sophien Ruh Farm, and the 5-fathom curve extends along the coast at the distance of about 1 mile. Between Dreimansdorf and Orrenhof, a short distance north of it, the woods extend to the beach, and as far as Cape Saare-ninna the coast increases in height and is partly wooded. From Cape Saare-ninna, which is low and rocky, 9 miles northward of Orrenhof, to Taker Ort, the eastern entrance point of Pernau Bight, the coast is low, with foul ground extending from it for a distance of nearly 3 miles.

At a short distance northward of Cape Saare-ninna and about $1\frac{1}{2}$ miles inland lie the Pignorum Hills, 130 feet high, and wooded.

Landmarks.—Useful landmarks on this part of the coast are, a church near the Aa River, and Peter Chapel to the northeastward, both white with a green tower; in Sala, the Orthodox Church, a red brick building, and the Lutheran Chapel, white with green tower; the white chimney of a sawmill at Alt Salis; a mansion with belvedere, and a large white stone mill, at Gainash; a white stone mansion at Orrenhof; a red church with dark spire, and a large white stone mill, near Gutmansbach; Gutmansbach Church, a white building with green roof and two cupolas, and Taker Ort Lutheran Church, gray with green roof.

Sala River, about $14\frac{1}{2}$ miles northward of Sophien Ruh Farm, has a depth of 2 feet on the bar, and 11 feet within; its banks are steep-to and well cultivated. The town Salis is situated at the mouth of the river, and the anchorage, in a depth of 2 fathoms, rocky bottom, lies about a mile westward of the entrance.

The large vessels, however, generally load at Gainash, about 6 miles northward of Salis.

The principal export is timber, which is brought from Salis in lighters; the crews of vessels have to stow the cargoes, as labor is difficult to obtain.

Meat is the only provision to be procured; fresh water is scarce.

Life-saving.—There is a lifeboat station at the entrance of Sala River.

Gainash Harbor is sheltered from the southward and partly from the southwestward and westward; it has depths up to 16 feet, where vessels can load, partially protected by off-lying shoals and a breakwater; they must then move to the outer anchorage, distant 2 miles further from the shore, to complete their cargo. Although there is no shelter whatever at this latter anchorage, and the bottom is indifferent, vessels with good ground tackle have ridden out a gale here in safety.

Two moles extend from the shore at Gainash, and a breakwater, about 1,400 feet long in north-northeast and south-southwest direction, with an elbow in the south part, lies $\frac{1}{2}$ mile from the shore, northward of the line of range lights.

The entrance channel is marked on the northern side by four red spar buoys with flags, and on the southern side by four white spar buoys with flags; on this line there is a depth of 10 feet 850 yards outside the breakwater. A rock in the port itself is marked by a red spar buoy with flag. Gainash is connected with the railway system.

A fixed light, with red and green sectors, elevated 26 feet above the sea, and visible 3 miles, is exhibited from a black lantern on white beacon, on the southern end of the detached breakwater.

Pilots are available, and conduct vessels to the anchorage.

Directions.—Gainash is best approached from the west-northwest. When about $1\frac{1}{2}$ miles south of Petrova Grund steer for Gainash mill, but without local knowledge a pilot should be waited for outside.

Pernau Approach—Eastern side—Shoals—Buoys—Dalnaya Shoal.—Between Salis and Taker Ort there are several outlying shoals; Dalnaya, the westernmost, with a depth of $4\frac{1}{2}$ fathoms, and 6 to 9 fathoms close around, lies $4\frac{1}{2}$ miles 276° from Rand Vacht; the western side of this shoal is marked by a black and white spar buoy, surmounted by two black brooms, bases toward each other, over a black and white ball.

Randa Bank, with general depths of 9 to 16 feet, extends $2\frac{1}{2}$ miles from the shore, between Sala River and Gainash Point; near the western edge of this bank there are two shoals with 6 feet water, about $\frac{1}{2}$ mile apart, northwest and southeast from each other. The northern shoal is marked by a black and white spar buoy with two black brooms, bases toward each other, on its western side, and the southern, named Randa Shoal, by a red spar buoy with red up-turned broom near its southern side.

A channel with a depth of 16 feet exists between Randa Bank and the shore. It is marked on the eastern side by 3 black and white

spar buoys, each surmounted by 2 black brooms, bases together; and on the Randa Bank side by a red and white spar buoy surmounted by two red brooms, bases apart.

Daragana Shoal, with $2\frac{1}{2}$ fathoms of water, and 4 to 5 fathoms close around, lies about midway between Dalnaya Shoal and Randa Bank.

Petrova Grund, with $2\frac{3}{4}$ fathoms, rocky bottom, and 4 to 5 fathoms close around, lies $3\frac{1}{4}$ miles 323° from Gainash Point; the northwestern edge of this grund is marked by a black and white spar buoy, with two black brooms, bases together.

Rock reported.—The steamship *Nordensheld*, drawing 12 feet, is reported (1914) having touched on a rocky reef about $1\frac{1}{2}$ miles from the shore off Orrenhof, and about $4\frac{1}{4}$ miles northward of Gainash Light.

Bystry Bank, situated 6 miles northward of Petrova Grund, is about $1\frac{3}{4}$ miles long north and south, and $\frac{3}{4}$ mile broad, with general depths of $4\frac{1}{2}$ fathoms, rocky bottom; on this bank there is a shoal with $1\frac{3}{4}$ fathoms of water, the western edge of which is marked by a black and white spar buoy, surmounted by two black brooms, bases turned together, over a black and white ball.

Pignorum Kor, with a depth of 10 feet, lies 2 miles from the shore abreast Pignorum Hills; the western side of this shoal is marked by a black and white spar buoy, surmounted by two black brooms, bases together, over a black and white ball.

About 6 miles west of Pignorum Point is a patch of 5 fathoms, with 6 fathoms around.

Kik Kor Shoal, with a depth of 9 feet, lies $1\frac{1}{2}$ miles west-southwestward from Taker Ort Point; the western edge of this shoal is marked by a black and white spar buoy with topmark of two black brooms, bases turned together.

A shoal, with a depth of $2\frac{1}{2}$ fathoms over it, is situated $5\frac{3}{4}$ miles 67° from Sorkholm Light and $2\frac{3}{4}$ miles from the shore. It is marked on its western side by a black and white spar buoy surmounted by two black brooms turned toward each other, and on its eastern side by a red and white spar buoy surmounted by two red brooms turned away from each other.

Western side.—**Kinö (Kyuno)**, the southernmost and largest of the islands fronting Cape Tovilaid, is $3\frac{3}{4}$ miles long north and south, 2 miles across, and covered with low pine trees; it is tolerably high, except in the northwest and southwest parts. St. Nicholas Church, near the center of the island, is easily distinguished from seaward. Southward of the church is a large yellow building with red roof, and between it and the church is a mast with vane.

Kinögrund (Kyunogrund) is separated from the shoal ground extending from the southern point of Kinö (Kyuno) by a channel

about 1 mile wide, with depth of 5 to 6 fathoms. This grund is $3\frac{1}{2}$ miles in extent north and south and about $1\frac{1}{4}$ miles broad, with general depths of 3 to $4\frac{1}{2}$ fathoms and 6 to 7 fathoms close around. In the northeastern part there is a rock with 6 feet water, from which Kinö Lighthouse bears 43° , distant 3 miles. The southern part, with $3\frac{3}{4}$ fathoms, $5\frac{1}{2}$ miles southwestward of the light, is marked by a red spar buoy with upturned broom. The north end of the grund is marked by a white spar buoy with black downturned broom.

Shoals—Buoys.—Kinö (Kyuno) is surrounded by rocks and shoals, some of which extend $6\frac{1}{2}$ miles in a northwestern and $3\frac{1}{2}$ miles in a northeastern direction. The northwestern and northeastern extremities of these shoals are marked by spar buoys. Foul ground with numerous rocks above water extends 2 miles from the southeastern side of the island and is marked on the eastern side by a red and white spar buoy surmounted by two red brooms, bases apart, and on the southern side $2\frac{3}{4}$ miles from the southern end of the island a red spar buoy with upturned broom is moored. A red spar buoy with upturned broom is moored on the southern side of a shoal of 1 fathom $1\frac{1}{2}$ miles eastward of Peliots Point, the northeastern extremity of Kinö.

Telegraph cable—Buoys.—The telegraph cable, between the northern part of Kinö Island and the mainland, is marked by seven black spar buoys surmounted by white upturned brooms; vessels are cautioned against anchoring in the vicinity of the cable.

Light.—On Pikanaots Point, the southern extremity of Kinö (Kyuno), stands a white iron lighthouse, 83 feet high, from which, 93 feet above the sea, is exhibited a revolving white light. (For details see Light List.)

There is a pier 84 feet long, with 2 feet of water. Telephone to Pernau.

Kinösund, between Kinö and Maniyalaid Islands, is buoyed, and navigable by vessels of not more than 10 feet draft.

Life-saving.—There is a lifeboat station at Pikanaots Point.

Sorkholm, situated 6 miles east-northeastward from Kinö (Kyuno), and 4 miles from Cape Tovilaid (Torilaid), is about $\frac{1}{2}$ mile long north and south, and 160 yards across, with a lighthouse on the northern point. The island is high in the middle, covered with bushes, and nearly surrounded by rocks, some of which are above water. On the eastern side of the islet there is a small sandy bay where landing may be effected.

Between Sorkholm and the mainland to the northward the ground is foul and rocky.

Buoys.—Foul ground, with 2 feet least water, and steep to on its eastern side extends 3 miles southward of Sorkholm; the southern extremity of this ground is marked by a red spar buoy with up-

turned broom. The eastern side of this foul ground is marked by three red and white spar buoys, each with a topmark of two red brooms, bases apart.

A shallow reef lies north-northeastward of Sorkholm; its northern end, with 6 feet, is marked by a white spar buoy with black down-turned broom, lying 1.7 miles from Sorkholm Lighthouse.

Light.—A fixed red light is exhibited 63 feet above the sea, from a red brick tower, 53 feet high, situated on the northern point of Sorkholm.

Keris, a shoal with 3 feet on it, lying about $2\frac{1}{2}$ miles northward of Sorkholm, is marked on its southern side by a red spar buoy with upturned broom.

Maniyalaid Island, separated from Cape Tovilaid (Torilaid) by a channel $\frac{1}{2}$ mile wide with 2 feet water, consists of a narrow granite ridge $2\frac{1}{2}$ miles long northeast and southwest. Between Sariots Point, the northern extremity of Maniyalaid Island, and Kirikunina Point there is a flat with depths of 2 to 3 feet only.

Pernau Bight.—Pernau Bight is about 8 miles long northeast and southwest, and $6\frac{1}{2}$ miles wide at its entrance, between Taker Ort and Kirikunina Points, in which there is a depth of $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, decreasing gradually to $2\frac{1}{2}$ fathoms off the mouth of Pernau River at the head of the bight. The 3-fathom curve lies about $3\frac{1}{2}$ miles from the shores of the bight within the entrance points, off which it extends about 1 $\frac{1}{2}$ miles. On the eastern side of the bight the 3-fathom curve is marked by two black and white spar buoys, each surmounted by two black brooms, bases together. The shore westward of the river is low and marshy, but eastward, as far as the swampy point Takerort, it is sandy and stony.

Landmarks.—The principal landmarks in Pernau Bight are, on the west side, Podis Church, a white building with green cupola, and Audern Chapel. On the southeastern side are Ula Church, with green roof, and the Orthodox Church on Takerort Point, red, with green roof. At the head of the bight two churches in Pernau and the beacons there are good marks.

Pernau River Entrance is formed by two moles extending 1 mile in a southwest direction, parallel to each other, and 250 yards apart; the outer extremities are marked by beacons, which are wooden tripods with crossbeams, each 32 feet high, and surmounted by an open disc; the beacon on the western mole is painted black, and that on the eastern mole red. On the southeastern side of the river, westward of the town, there are two gray frame beacons, 420 yards apart; these beacons in line, 39° lead over the bar, and between the moles.

Navigable depths.—The normal depth of water from the bar of Pernau River to 2 miles above the floating bridge is 17 feet and the river is navigable by small vessels 2 miles farther. The channel

may silt up somewhat in spring, when the ice leaves, but is in that case dredged to its ordinary depth as promptly as possible. South-west winds raise the water on the bar to 19 or 20 feet, but with north-east winds it falls to 16 feet and even less.

Roadstead.—Pernau Roadstead is in the inner part of Pernau Bight off the town and river entrance. Vessels find tolerably quiet and secure anchorage in 18 to 20 feet, bottom mud and sand; south and southwest winds send in some sea, which, however, is diminished by the shoal water, so that vessels with good anchor gear can ride safely.

Light and bell buoy.—A red light and bell buoy, exhibiting a flashing white light every $3\frac{1}{2}$ seconds, lies about 1,300 yards 213° from the outer end of the southern mole and 140 feet eastward of the line of range lights.

Ice.—The navigational period for the Port of Pernau is now recognized as follows:

For steam vessels, from April 14 to December 14.

For sailing vessels, from May 14 to November 14.

Pilots can be obtained at Pernau; the watch house is at the southern range beacon, and pilots go out to meet vessels in the road in a large boat, even in bad weather.

Signals.—There is a telegraph, International Code Signal, and storm signal station at the southern side of the river entrance at the northern (rear) light beacon.

Life-saving.—Two iceboats are stationed here.

Lights.—From the northern gray frame beacon westward of the town a fixed white light is exhibited 70 feet above the sea. (For sector see Light List.) The beacon is surmounted by a flagstaff and yard for making signals.

From the southern beacon a fixed red light is exhibited at an elevation of 45 feet above the sea. These lights in line, bearing 39° , lead over the bar and between the moles.

Harbor.—Pernau Harbor consists of the harbor proper, the entrance channel, part of the Saukski River, and the Winter Harbor.

The harbor proper, formed by the lower course of the river, extends from Pernau Bight to about 300 yards above the floating bridge, with a length of about 1,450 yards, a breadth of 210 to 395 yards, and an average depth of 17 feet in mid-channel. The bottom consists of soft and stiff clay, covered with fine and coarse sand, also with small stones in places. The low level banks are nearly everywhere still in their natural condition. Two quays have been constructed immediately above and below the floating bridge, each about 200 yards long, and there are some other private quays. Vessels often use the floating bridge for loading and discharging. Vessels

of deep draft are obliged, on account of the insufficient depth of the channel, to discharge and take in a part of their cargo in the roadstead.

The bed of the Pernau River runs with numerous windings between sandy banks, which, now low and flat, now more steeply rising, are constantly damaged, owing to varying width and unequal current. A great part of the sand washed away is carried by the current to the mouth of the river and is deposited, partly in the wide part of the river below the town and partly on the bar outside the moleheads, whereby the depth in spring is reduced to 9 and 10 feet. As soon as the road is clear of ice, dredging is commenced, and continued as a rule till the autumn.

The bed of the channel between the moles is 350 feet wide, with a depth of 12 to 18 feet.

The entrance to the Saukski River is dredged to a depth of 17 feet and is used by vessels.

The Winter Harbor, on the left bank below the town, formed by the moat of an old fort, is about 465 yards long, 42 yards wide in the middle, with a depth of 10 to 12 feet.

Buoys.—The channel on the bar and between the moles is marked on the southeast side by white spar buoys with black down-turned broom topmarks, and on the northwest side by red spar buoys with upturned brooms. Besides these there are two buoys in the harbor, one below the bridge for a vessel anchored in the stream to secure to, the other above the bridge for vessels warping through the opening in the bridge.

Pernau, situated on the south bank, near the mouth of the Pernau River, has a population of about 20,000, possesses a considerable number of shipping, and an active trade. It is connected with the suburb of Bremerseite on the north bank, by a floating bridge. Saukski River, which flows into the Pernau below Bremerseite, is crossed also by a small bridge. The buildings in the town are of wood for a great part. Besides the churches the largest buildings are an oil mill, cigar, looking-glass, and cloth factories; other industries are celluloid and sawmills.

Communication.—There is a railway to Petrograd (St. Petersburg) via Pskof; and during the shipping season there is regular communication by steamer with Riga and Petrograd (St. Petersburg) if necessary.

Coal can be obtained at Pernau, and steamers can coal alongside a wharf.

There are good facilities here for discharging coal from colliers: as much as 1,000 tons have been taken out of a vessel in 24 consecutive hours. In 1912, about 136,000 tons were imported, mostly British.

Trade.—The principal exports are flax, burnt ore, linseed, flaxseed, grain, wood pulp, and wood goods; the chief imports are coal, iron pyrites, chemical manure, felt, and herrings.

Directions.—Having passed Domesness Lighthouse at a distance of about 1 mile, steer 76° , which will lead about 2 miles northward of the two white spar buoys marking the northern extremity of the shoal extending from the northern end of Runö, and 1 mile southward of the red spar buoy on Kinögrund (Kyunogrund).

When Kinö (Kyuno) Lighthouse bears 0° steer 50° , and pass southeastward of the Sorkholm Reef; when Sorkholm Lighthouse bears 344° and the vessel is $\frac{1}{2}$ mile or more southeastward of the southern red and white spar buoy, with two brooms, bases apart, marking the eastern side of the reef, alter course to 26° , which leads to Pernau Roadstead, where a vessel may anchor as convenient in a depth of about 3 fathoms, sand and mud, on the edge of the shallow water, about 6 miles northward of Takerort Point, or wait for a pilot.

Vessels must not pass within the fairway light and bell buoy in the roadstead without a pilot.

The coast from Kirikumina Point, the western point of Pernau Bight, trends in a westerly direction $5\frac{1}{2}$ miles to Cape Tovilaid (Torilaid) and is fronted by a number of small islets and shoals, thence in a northwesterly direction 13 miles to Semeri Peninsula, having between several small bays and sharp promontories. On the eastern side of Semeri Peninsula there are a few small islands surrounded by rocks, some of which are above water, and the ground is foul for a distance of $6\frac{1}{2}$ miles to the southward. This part of the coast should not be approached within a depth of 10 fathoms.

From Semeri Peninsula the coast trends north-northwestward for $6\frac{1}{2}$ miles to Cape Moisavirguser, thence in a northerly direction 4 miles to Tamba Farm, and consists chiefly of low cliffs, rocks, and sand, with several off-lying shoals. On a ridge of hills about 5 miles northward of Semeri Peninsula and about 2 miles inland stand the villages Neu Verpel and Alt Verpel.

Landmarks.—A large white mill, southward of Telli (Selli); Telli (Selli) Church, with dark green spire-shaped cupola; Testama Church; the frontier guardhouse on Cape Kastna, a yellow building with white roof; and the farm buildings of Kastna, $8\frac{1}{2}$ miles northward of Cape Tovilaid (Torilaid), consisting of two stone buildings with red roofs and two or three white chimneys, also a barn with red roof.

The best landmarks on this part of the Esthland Coast are the mill and wood of Verpel and a tavern on the Semeri Peninsula.

Alexandra Rock, with 6 feet water, lies on the northwestern extremity of the shoal ground, extending nearly $6\frac{1}{2}$ miles in that direc-

tion from Kinö (Kyuno) Island. It is marked to the northward by a white spar buoy with black down-turned broom. Between this rock and the island lie numerous islets and rocks, some of which are above water.

About $2\frac{1}{2}$ miles northwestward from Alexandra Rock and $5\frac{1}{2}$ miles southwestward of Cape Kastna is the southern end of a shoal with 3 feet of water, which extends northward for $\frac{3}{4}$ mile and is marked by a red spar buoy with upturned broom at the southern end and a white spar buoy with black down-turned broom at the northern end.

Vaist Bay, $2\frac{3}{4}$ miles eastward of Semeri Peninsula, is formed on the east by Cape Kastna and on the west by a reef extending from Raispa (Raispaninna) Point. It is about 3 miles deep and 1 mile wide at the entrance, with depths of $4\frac{1}{2}$ fathoms, decreasing to 9 feet near the head of the bay, bottom fine sand and clay. Although this bay is exposed to southerly gales, the shoals extending from Kinö (Kyuno) prevent a heavy sea from setting in. From Semeri Peninsula and the land between it and Vaist Bay a rocky reef, with depths of from 2 to 6 feet, extends 2 miles to the southward and is connected by a ridge with less than 5 fathoms on it, with the reefs extending northwest from Kinö. About $1\frac{3}{4}$ miles 168° from Semeri Peninsula is a shoal of 3 feet.

When approaching Vaist Bay from the westward, it is necessary to pass through the channel lying between the reef which extends from Semeri Peninsula and Alexandra Rock, in which passage the depth is 19 feet to $4\frac{1}{2}$ fathoms; vessels are recommended not to use it without local knowledge.

Between Cape Moisavirguser and Tamba Farm there are numerous small, low, bare islands, surrounded with rocks.

Shoals.—From Semeri Peninsula to Cape Moisavirguser the soundings are very irregular, and shoal water extends in some parts a considerable distance from the shore.

Larina Shoal, with $1\frac{3}{4}$ fathoms of water and a depth of 4 to 5 fathoms around, lies $2\frac{3}{4}$ miles from the coast, west-southwestward of Neu Verpel; the western side of the shoal is marked by two black and white spar buoys, each surmounted by two black brooms, bases turned together, and a light buoy. From the center of Larina Shoal, the northwestern extremity of Semeri Peninsula bears 128° , distant about $4\frac{1}{4}$ miles.

Light buoy.—A white light buoy, marked "Japan" and exhibiting a flashing white light, is moored 1.2 miles westward of the $1\frac{3}{4}$ -fathom head on Larina Shoal.

About 2 miles westward from Larina Shoal lies Afonasieva (Afan-asieva) Shoal, with a depth of $3\frac{3}{4}$ fathoms, and 8 to 9 fathoms around.

Ösel, situated at the entrance of the Gulf of Riga, is 50 miles long northeast and southwest, and 30 miles broad; it is composed chiefly of limestone and is thickly wooded; the bottom near the southeastern shore is sand, with small pieces of limestone and occasionally mud.

The coast lines are very broken and irregular; among the many peninsulas formed by the numerous bights, Sworbe in the south and Hundsört in the northwest are the most worthy of note. Generally low and flat, the island rises a little in the middle and north; the coasts are mostly low, only in the north and on the east coast of Hundsört are there high and rocky slopes. The highest point of the island is in the northwest, where a wooded hill rises to a height of 65 feet above the plain. The island has 8 large and 14 small lakes, as well as about 50 small rivers; of the latter, the Nasva, about 1 mile long, situated westward of Arensburg and connecting Lakhta Lake with the sea, is the broadest, and is navigable by small craft. The others are small and shallow; many dry completely in summer; often they are only the discharge from lakes and marshes.

The inhabitants are Esthonian, and are engaged in agriculture and cattle raising; those on the coast live by fishing.

Southeast Coast.—Between Kibbosar Peninsula, the eastern extremity of Osel, and Fettel Point 23 miles southwestward of it, the coast is low, with several small bays, most of which are shallow.

Landmarks.—The churches of Peide, Volde, and Pia, and the plantation on Kibbosar Peninsula (which can be seen from a distance of 10 miles) are conspicuous objects on this side of the island; on the south point of the peninsula is a guardhouse.

Udriklaid, a crescent-shaped island, convex to the south, about $\frac{3}{4}$ mile in extent north and south, lies westward of the south end of Kibbosar, between it and Murraya Peninsula; it is conspicuous, as also are Tudinasva Rocks, about 1,400 yards southward of Kibbosar.

Shoals—Buoys.—About $1\frac{3}{4}$ miles southeastward of the southern extremity of Kibbosar, a red and white spar buoy, surmounted by two red brooms, bases turned apart, is moored on the eastern side of a 15-foot shoal.

Between Kibbosar Peninsula and Seretik Point, 18 miles to the southwestward, there are numerous shoals, with 2 to 4 fathoms water, extending 4 to 5 miles from the shore. The outermost of these shoals, with a depth of $2\frac{1}{2}$ fathoms, lies $7\frac{1}{2}$ miles 193° from Laidunina Light, and 4.3 miles from the shore, and is marked on its eastern edge by a red spar buoy with upturned broom topmark.

Laidunina Point Light.—A group flashing white light, elevated 90 feet above the sea, is exhibited from a red brick cylindrical tower, 77 feet in height, situated on Laidunina Point. The light-

house is connected by telephone with Orrisar coastguard, $19\frac{1}{2}$ miles northward.

Galliray Islet.—Galliray, a small bare islet, lying $3\frac{1}{2}$ miles 138° from Fettel Point, is surrounded by broad reefs, which are marked on the northern, eastern, and southern sides by spar buoys with the appropriate colors and topmarks.

Light.—A flashing white light, 40 feet above the sea, is exhibited from an iron beacon, 34 feet high, situated on Galliray Islet.

The bay between Seretik and Fettel Points is occasionally used as an anchorage; vessels bound to this bay should approach Galliray Islet from the eastward. When this islet bears 260° , distant about $2\frac{1}{2}$ miles, a 328° course will lead into the bay, where a vessel may anchor in a depth of $3\frac{1}{2}$ to 5 fathoms sand, according to draft.

From Fettel Point to Swalfer Ort, 27 miles southwestward of it, there are several small bays and projecting points, with numerous off-lying islands and shoals. On the eastern side of Sworbe Peninsula, at the northern end, the pinewood at Vigt and Ansekil Church serve as landmarks.

Arensburg Bay is bounded on the east by the islands Tulipsar, Abro or Abrackan, and Keriü, with their surrounding shoals, and westward by a curve in the coast line, forming a shallow bay between Liodi Point and Merris Point, 7 miles southwestward of it. Liodi Point, which is covered with a plantation, has several rocks and shoals extending 2 miles southeastward; about 1 mile westward of the point is Nasva River, about 55 yards wide, the outlet of Lakhta Lake. The shore for 3 or 4 miles westward of Liodi Point is composed of sand and somewhat elevated, thence to Merris Point it consists of low meadowland.

Arensburg Bay is about $6\frac{1}{4}$ miles across between Merris Point and Baksa-koo, an island close westward of Abro, with depths of $3\frac{1}{2}$ to 8 fathoms sand and mud.

The anchorage is about 4 or 5 miles from the town, and vessels load and discharge by means of lighters.

Large vessels must lie in the roads, quite open to the southward, and in bad weather can not communicate with the shore.

The channel leading from the roads to the town is silted up, but small vessels can load at Ramasaar Pier in a depth of 10 to 11 feet at mean level about $1\frac{1}{2}$ miles southeastward of Arensburg.

Lights.—On the eastern extremity of Abro Island a fixed white light is exhibited, 70 feet above the sea, from a white, wooden, triangular structure 66 feet high. (For sector see Light List.)

About 690 yards 259° from the above another fixed white light is shown, 88 feet above the sea, from a white octagonal tower 85 feet high, painted red on the southeastern side. (For details see Light List.)

On the extremity of the pier extending from the southern point of Ramasaar Peninsula a fixed white light is exhibited from a red iron post with black planking, appearing as a black rectangle from seaward, at an elevation of 47 feet above the sea. (For sector see Light List.)

About 700 yards 322° from the front light another fixed white light is shown from a red beacon at the height of 77 feet.

The above two lights in line, 322° , are range marks for the channel to Ramasaar, eastward of Abro, which is much encumbered with shoals, some of which are marked by spar buoys.

Islands and dangers—**Abro or Abrackan Island** is $3\frac{1}{2}$ miles long north and south, $1\frac{1}{2}$ miles broad, surrounded by rocks, and nearly covered with trees. Near the middle of the island stands a villa, and on the northern and southern extremities there is a coast-guard station. Kessemäa, near the eastern side, Linusit, eastward of the south point, and Kaksa-koo, near the western side of Abro, are low islands covered with grass.

Keriu—Beacon.—Keriu, a small sandy islet having on it a red pyramidal beacon 35 feet high, with cross battens, lies 2 miles southeastward of the south extreme of Abro. A narrow rocky flat with a depth of 3 to 5 fathoms, and 6 to 9 fathoms close-to, extends $2\frac{1}{4}$ miles south-southeastward from Keriu; the southern extremity of this flat is marked by a red spar buoy with up-turned broom.

Shoals.—The channel eastward of Abro is so encumbered by shoals that the chart or local knowledge can be the only guide. The least depth on the range line is about 12 feet.

Kirgogrund, with a depth of $1\frac{3}{4}$ fathoms, rocky bottom, and 6 fathoms close around, lies 2.7 miles southward of Abro; this grund, nearly $\frac{1}{2}$ mile in extent, is marked on its west side by a black and white spar buoy, with topmark of two black brooms, bases toward each other.

South Kalk Grund, situated with its southern extremity $8\frac{1}{4}$ miles 195° from Abro, is $2\frac{1}{4}$ miles long north and south and $\frac{1}{2}$ mile broad, with general depths of 5 fathoms and 8 to 11 fathoms close-to; toward the northern end there is a depth of 4 fathoms, and the southern end has 6 feet only near the western extremity. The southern edge of this grund is marked by a red spar buoy with up-turned broom, in a depth of 6 fathoms, and the northeastern edge by a white spar buoy with black down-turned broom.

Northwest Kalk Grund extends in a southeasterly direction 4 miles from the shore, between Merris Point and Ansekil Church, $2\frac{1}{4}$ miles southward of it. The general depth on this grund is 15 feet, but near the southeastern extremity there is a shoal with 1 foot of water. About $\frac{3}{4}$ mile northeastward from this shoal a spar buoy with

broom topmark is moored in a depth of $5\frac{1}{2}$ fathoms, and about the same distance south-southeastward there is a red spar buoy with upturned broom, moored in 6 fathoms. Nearly 1 mile southward of this Kalk Grund there are shoals with depths of $3\frac{1}{2}$ and 4 fathoms.

Clearing mark.—St. Laurence and St. Nikolas Churches in Arensburg, in line, bearing 31° , lead eastward of the foul ground on the western side of the bay, lying northward of Northwest Kalk Grund, but over that grund.

Pilots can be obtained at Arensburg, but they are not appointed by government.

Arensburg, a small town over 2 miles in circumference, is the largest in Ösel Island, and lies on the northern side of Arensburg Bay. A tolerably active trade is carried on. The town has two churches and a ruined castle. There is regular steamer communication with Riga, Pernan, Möönsund, Hapsal, Revel, and Petrograd. There is a telegraph station in the town.

Trade.—Grain, fish, and some cattle are exported; salt, iron, petroleum, tobacco, groceries, and textile fabrics of different kinds are imported.

Sworbe Peninsula, the finest part of Ösel, projects about 16 miles in a south-southwest direction from the south coast of that island, with a greatest width of 6 miles. A ridge of hills extends in the direction of its length from Ansekil to Meit, where it is highest, and is tolerably steep toward the east; on the west it slopes gradually, and on that side are several conical hills covered with pine trees. The eastern shore, from Merris Point to Swalfer Ort or Tserel Point, the southern extremity of this peninsula, is low and in some parts marshy and covered with plantations. About 1 mile southward of the point at Kavi, on which is a guardhouse, lies a small rocky islet about 800 yards from the shore, with which it is connected by a chain of rocks.

Shoal.—Nearly midway between Merris Point and Swalfer Ort, about 2.7 miles from the shore, lies a shoal covered with $11\frac{1}{2}$ fathoms of water; from it Merris Point bears 358° , distant $7\frac{1}{2}$ miles.

Kavi Bank, with a depth of 5 feet over it, is situated $5\frac{3}{4}$ miles 60° from Swalfer Ort Lighthouse, and $1\frac{1}{4}$ miles from the shore; it is marked on the eastern side by a red and white spar buoy surmounted by two red brooms, bases apart, moored in 6 fathoms water.

Swalfer Ort Light.—The lighthouse on Swalfer Ort is a square white stone building, 113 feet high, from which is exhibited 119 feet above the sea, an occulting white light visible 17 miles. It is shown during the whole navigable season. In clear weather the eclipses are not total, and in the obscured arc, near the limits of visibility, faint flashes are seen. (For details see Light List.)

The lighthouse stands about $\frac{1}{2}$ mile northward of Tserel Point, the extremity of a low, narrow spit projecting southward.

Telegraph—Life-saving.—There is a telegraph and lifeboat station at Swalfer Ort, and a telephone to Arensburg.

There is a pier with $2\frac{1}{2}$ feet of water alongside.

Shoal.—A shoal of $2\frac{3}{4}$ fathoms lies 1.7 miles 150° from Swalfer Ort Lighthouse. It lies on the southwest end of a narrow bank of 5 fathoms, $1\frac{1}{4}$ miles in length, with 6 and 7 fathoms around.

Dal Spit, composed of gravel and sand, which partially dries, extends $3\frac{1}{4}$ miles south-southwestward from Tserel Point; it is steep-to on the eastern, and shoals gradually on the western side.

On the northern end of Dal Spit lies a narrow sandy islet, named Dal, 400 yards northeastward of which there is anchorage in a depth of $1\frac{1}{2}$ to 2 fathoms of water; it can not, however, be used without local knowledge.

Dal Grund, with uneven depths of 2 to 4 fathoms, lies $1\frac{1}{2}$ miles southward of Dal Spit, with detached patches of $1\frac{1}{2}$ to 2 fathoms between. It is 6 miles long northwest and southeast, and $1\frac{1}{2}$ miles broad. On the eastern extremity of Dal Grund there is a small shoal with 6 feet water, from which Swalfer Ort Lighthouse bears 9° , distant 6 miles.

Buoys.—The eastern side of the 6-foot shoal on the eastern end of Dal Grund is marked by two red and white spar buoys, each with two red brooms, bases apart. The southern extremity of the grund is marked by two red spar buoys with upturned brooms, and the southwestern and western sides by 24 black and white spar buoys, each with two black brooms, bases toward each other, moored 700 yards apart.

During west and northwest winds vessels occasionally anchor in a depth of 10 to 14 fathoms on the eastern side of Swalfer Ort and Dal Spit.

Directions.—Vessels from the Baltic, bound for Arensburg, and having passed through the channel southward of Michael Bank and Dal Grund, should, when Swalfer Ort Lighthouse bears 355° , distant about 10 miles, steer 30° , which will lead midway between the Northwest and South Kalk Grunds, and to the entrance of Arensburg Bay. Vessels from Riga or Möönsund may pass northward of South Kalk Grund, and when the ruins of the castle at Arensburg are seen clear of the wood on Abro, the Kirgogrund will have been passed, and a course may be steered for the anchorage in Arensburg Bay.

The coast from Swalfer Ort trends in a north-northwestward direction 5 miles, and northeastward 8 miles, to the entrance of Leo Bay; between Swalfer Ort and Iamma Church the shore is low and

wooded, thence to Leo Bay it is shoal and rocky, with some small wooded hills.

Leo Bay, $2\frac{1}{2}$ miles deep and $1\frac{1}{2}$ miles broad, is well sheltered from all winds, and has good anchorage for vessels of not more than 15 feet draft. On the western side of the entrance is the small island Ostlelaid, and on the northern side the rock Krimmilaid, both surrounded by reefs. In the entrance there is a shoal with $1\frac{1}{4}$ fathoms least water.

From Leo Bay the coast trends northwestward for 15 miles to Melaido or Hansta Point, 40 feet high, and has several inaccessible bays and off-lying dangers.

Meldri Bay, about 5 miles northward of the western entrance point of Leo Bay, affords good anchorage for light-draft vessels. The range mark into the bay consists of two white stone cairns, 6 feet high, visible from a distance of $4\frac{1}{2}$ to 5 miles, which in line bear 48° . This range line passes over a $2\frac{1}{2}$ -fathom shoal from 300 to 1,200 yards inside the outer spar buoy. The channel is marked on the northwestern side by two red spar buoys with upturned brooms and one red and white spar buoy with two red brooms, bases apart. Northward of the inner red spar buoy there is anchorage in from 18 to 20 feet.

About 3 miles south-southeastward of Melaido Point there is a small bay near Karral Village, useful only for vessels drawing less than 8 feet water: midway between them, and $\frac{1}{2}$ mile off-shore, is the small islet of Hinnaragu.

Shoals.—Between Leo and Karral Bays the Danish chart of 1853 shows two off-lying patches, with depths of $3\frac{3}{4}$ and $2\frac{3}{4}$ fathoms, the former 2 miles south-southwestward from the island in the mouth of Nasva Bay, the other, $2\frac{1}{2}$ miles west-northwestward of the former, 2 miles south-southwestward from Paisterd Island.

Lights.—A fixed white occasional light is shown from Ktunispe (Kaunispe) Pier, from August 14 to January 14.

Fixed white fishing lights are shown occasionally at Ragusta (Ragudis) Post, near Meldri Village and Munganin Guard. Occasional fishing lights are shown at Karrust, Tiriü, and Iamma.

Vulchur or Laimadal Banks, with $1\frac{1}{2}$ to 3 fathoms of water, situated 5 miles southwestward from Melaido Point, and $4\frac{1}{2}$ miles offshore, are 2 miles long north-northwest and south-southeast, and from $\frac{1}{4}$ to $\frac{1}{2}$ mile broad.

Buoys.—The western side is marked by four black and white spar buoys, each surmounted by two black brooms, bases turned together; and the southern side by a red spar buoy with upturned broom.

About 1 mile eastward of Vulchur Bank there is a large shoal named Petkelma, with $\frac{1}{4}$ to 3 fathoms of water, and $1\frac{1}{4}$ miles south-

ward there is a shoal with a depth of $4\frac{1}{2}$ fathoms, from which Melaido Point bears 25° , distant $7\frac{1}{2}$ miles.

The $\frac{1}{2}$ -fathom depth lies on the northwestern edge of Petkelma Shoal, in a position nearly 3 miles from the shore, with Melaido Point bearing 24° , distant 4 miles.

Melaido Reefs.—South Letenholm, with 3 fathoms, rock, lies 6.3 miles 228° from Filsand Lighthouse. North Letenholm, with 3 fathoms, rock $1\frac{1}{2}$ miles north-northwestward from South Letenholm; between these reefs there are depths of 6 to 8 fathoms.

Saruichev Bank, with $2\frac{1}{2}$ fathoms on it, lies 9 miles westward of Melaido Point, and is marked on its western side by a black and white spar buoy with two black brooms, bases together, over a ball. This vicinity should be avoided.

Shoals.—About $5\frac{1}{2}$ miles westward of Saruichev Bank, and $15\frac{1}{2}$ miles 249° from Filsand Lighthouse, is a patch with a depth of $4\frac{1}{2}$ fathoms over it; this shoal is marked on its western side by a black and white spar buoy, surmounted by two black brooms with bases turned to each other.

About 1,600 yards southward from the above, another shoal exists, with a depth of 5 fathoms, marked on the western side by a similar spar buoy.

Light vessel.—A light vessel named *Saruichev* is moored in a depth of 15 fathoms on the western side of the $4\frac{1}{2}$ and 5 fathoms banks, nearly 16 miles 248° from Filsand Lighthouse; it shows, 49 feet above the sea, a flashing white light; a riding light is also shown.

The lightvessel is painted red, with a broad vertical white stripe, in which is the letter C in black, on each side; has two masts and a yellow funnel and carries two black balls at the foremast and a yellow flag with St. Andrew's cross at the main. If the vessel is out of position, the flag on the mainmast will be hauled down and the light will not be exhibited.

In the event of the flashing light becoming disabled two fixed white lantern lights will be hoisted, placed horizontally, in the position of the balls. (For details see Light List.)

Fog signal.—A siren, worked by compressed air is sounded on Saruichev Light Vessel. Should the siren be disabled, the lightship's bell will be sounded.

Signals are made with flags and rockets when vessels are seen standing into danger. (See Light List.)

The coast.—From Melaido (Hansta) Point, a shallow rocky flat extends $3\frac{1}{2}$ miles in a northwest direction. On this flat there are two islets named Salama and Letenholm. On the northwestern end of Letenholm, the northern islet, stand some fishers huts. The coast eastward from Melaido Point is deeply indented, but trends in that general direction 6 miles to Papensholm Peninsula, thence northwest-

erly $7\frac{1}{2}$ miles to Karilaid Peninsula, and is wooded as far as Kurefer Village, which stands on the southern end of a low ridge $2\frac{1}{2}$ miles northward of Papensholm Peninsula.

Attel Bay, on the eastern side of Melaïdo Point, is accessible to vessels of 8 feet draft. The peninsula forming the eastern side of Attel Bay is connected with Ösel by a low isthmus. From its northwestern point a very shallow reef, with many islets and rocks, extends to Filsand Island, about 2 miles northward.

On the eastern side of the above peninsula, between it and Rasa Peninsula, is a shallow bay, in which are several islets and rocks. Rasa is thickly wooded, with rocky coasts; from its northwestern end a chain of islets and rocks above water extends to the southeastern end of Filsand. The flat between Filsand and Ösel is here so shallow that at low-water level one can pass over on foot and at high level on horseback. At the root of the peninsula is the farm of Kusnem.

Between Rasa and Papensholm Peninsulas is Kūrasaar Bay, which is shoal, with several islets and rocks in it. Papensholm is joined to Ösel by a narrow isthmus and is closely wooded. On the northern side of Papensholm Peninsula there is a shallow bay, at the head of which stands Kilkond Church and Rotsikul Village. Outside this bay there is good anchorage for vessels drawing 14 feet. Owing to the numerous outlying dangers in this vicinity, seamen should not approach these bays without local knowledge.

Filsand Island, situated about 4 miles northward of Melaïdo Point, consisted formerly of two islands, named Great and Little Filsand. These are now joined by a narrow neck of land forming one island $3\frac{1}{4}$ miles long, east and west, and $1\frac{1}{4}$ miles across the broadest part. The eastern part of the island is low meadowland and the western wooded. On the southern side of the western part stands a village.

Filsand is surrounded by numerous islets, the largest of which, named Veziloma, is connected with the northern side of the island by a rocky reef above water. A reef with 12 feet water on its outer edge projects nearly 1 mile in a northwest direction from Veziloma, outside of which patches of $1\frac{1}{2}$ and 3 fathoms extend in the same direction for a distance of $1\frac{3}{4}$ miles, the northern patch, of $1\frac{1}{2}$ fathoms, being marked by a white spar buoy with black downturned broom. Filsand is connected with Ösel by a shallow rocky flat, previously mentioned.

Light.—On the western point of Filsand stands a white circular stone tower, 115 feet in height, from which, at an elevation of 136 feet above the sea, is exhibited a fixed white light. When to the eastward of the light, bearing between 348° and 168° , a faint light is visible. The light is shown during the whole of the navigable season. (For sector see Light List.)

There is a telephone station at the lighthouse; also a landing stage at which the depth is $6\frac{1}{2}$ feet.

Life-saving.—Near Filsand Lighthouse there is a lifeboat station.

Filsand Banks (Teufelgrund), with 3 feet to 3 fathoms, rocky bottom, extend about 5 miles westward of Filsand Island. The western side of these banks is marked by three white and black spar buoys each surmounted by two black brooms turned bases together.

Chernova Bank, with 4 to 5 fathoms, rock, $1\frac{1}{2}$ miles in extent northwest and southeast, lies about 8 miles westward from Filsand Lighthouse. The western edge of this bank is marked by a white and black spar buoy with two black brooms, bases together.

Riabina Shoal is said to be about 2 miles in extent east-northeast and west-southwest, to have a depth of 3 feet only, and to lie $5\frac{1}{2}$ miles northwestward from Filsand Lighthouse. It was shown on old Russian charts, but has not been found during more recent surveys.

The coast.—Karilaid Peninsula, $4\frac{1}{2}$ miles northward of Filsand Island, projects about 2 miles westward, and has on it only two trees, some bushes, and a fisherman's hut; from its extremity a reef extends over 4 miles in a northwest direction, with 4 fathoms at its outer end. During heavy gales the current sets strongly across this reef, the northern edge of which is marked by a white spar buoy with black down-turned broom, and the western side by two black and white spar buoys with topmarks of two black brooms, bases turned together; at such times it is dangerous to approach.

Between Karilaid Point (Kuria Lapki) and Hunds Ort (Khundva Point), the northwestern extremity of Ösel, there is a bay 2 miles deep and $1\frac{1}{2}$ miles across the entrance; in the middle of the bay there is a depth of 11 fathoms, and near the head shoals, with 12 feet water, lie about $\frac{1}{2}$ mile from the shore. From Hunds Ort a reef extends 1 mile in a northwest direction.

Life-saving.—At Kalingi (Kolingi) Village, a short distance southward of Hunds Ort, there is a lifeboat station.

Taggalaklet (Tagga Lakt) Bay (Hunds Wik), situated 4 miles eastward of Hunds Ort, is 5 miles long, in a southerly direction, $3\frac{3}{4}$ miles wide at its entrance, and wooded on both sides; in the middle of the bay there are depths of 14 to 16 fathoms, decreasing gradually to $2\frac{1}{2}$ fathoms near the head. This bay is exposed to northerly winds, but affords good anchorage on mud bottom abreast the steep white sand hills on the western shore. On Merris Point, the eastern entrance point, stands Merris Village, and near the head stands Piddul Farm. Surriarve Lake lies on the eastern side of the bay about $\frac{3}{4}$ mile south of Merris Point. In a village on the west shore of the bay near the white sand hills there is a well with good water.

Buoys.—This bay has been marked by three spar buoys with two brooms, bases apart, on the western side, one with a down-turned broom at the head of the bay, and two with two brooms, bases together, on the eastern side.

Mustelham (Mustel Wik).—From Merris Point the coast trends in a northeasterly direction $3\frac{1}{2}$ miles to Ninast Point, the western point of Mustelham, between which and Pank Point, the eastern point, the bay is $2\frac{1}{2}$ miles across: it is about 4 miles long in a southerly direction. In the middle of the bay there are depths of 12 to 7 fathoms, decreasing toward the head, from which shallow water extends nearly 2 miles. The shores of the bay are low and covered with plantations. Pank Point is 80 feet high, with perpendicular chalk cliffs seaward. About $1\frac{1}{2}$ miles southward of the bay stands Mustel Village and Church.

Vessels using this bay should anchor near the middle in a depth of 4 to 7 fathoms, sand, but it can not be recommended as an anchorage.

Sele Sund.—The coast from Pank Point trends in an easterly and northerly direction 9 miles to Pamerr Ort, on the southern side of Sele Sound; for about 7 miles eastward from Pank Point the 5-fathom curve lies about 1 mile from the shore. About midway there are two shoals having $1\frac{1}{2}$ and $1\frac{3}{4}$ fathoms of water, extending nearly $1\frac{1}{4}$ miles from the shore, and a shoal with 3 fathoms $1\frac{3}{4}$ miles further eastward.

Pamerr Ort is low and flat except for a small hill in the middle, on which there is a village.

The narrowest part of Sele Sund, between Pamerr Ort and the southern extremity of Dagö, is about 3 miles across, with numerous rocks and shoals, some of which are above water, extending from shore to shore. About the middle of the sund the shallow bank extends nearly 3 miles to the westward, and terminates in a cluster of rocks named Raudrakhy; southwestward $1\frac{1}{2}$ miles from these rocks there is a shoal with a depth of 1 fathom, marked on its southern side by a red spar buoy with up-turned broom, moored in a depth of 22 feet.

This sund is only navigable by small vessels, and, although buoyed, should not be attempted without local knowledge.

Lights.—At Serro, southern end of Dagö, two fixed white leading lights, elevated 45 and 30 feet, respectively, above the sea, are shown near the pier from September 14 to the close of navigation, when the local steamer is expected; in line they bear 313° . These lights will also be shown for other vessels on a signal being made by burning a flare-up or blue light.

The current, which runs from the northward through Wormsö Sund, partly passes through Sele Sund, when it divides into two branches, one flowing westward along the coast of Ösel, and the other

northwestward along the coast of Dagö to Dager Ort. Both branches join the main current running to the southward from the Gulf of Bothnia, the southern, near Karilaid Point, and the northern, near Dager Ort. The south-going stream along the west coast of Ösel joins that setting out of the Gulf of Riga off Swaffer Ort, and deposits matter, forming the banks in the entrance to that gulf. These currents are influenced according to the direction and strength of the wind.

Dagö, situated on the southern side of the entrance to the Gulf of Finland, is 30 miles long east and west, and 24 miles broad. The interior is flat and marshy, but the land rises gradually toward the north. On the northeastern coast wooded hills reach a height of 88 feet above the sea; the northwestern coast is lower and less wooded than the northeastern, the shore being for the most part rocky, also sandy in places, as at Takhkona Point.

While the closely wooded Dager Ort Peninsula rises to a considerable height, Mount Andrew, on which the high lighthouse is built, rising to a height of 222 feet, the southern part of the west coast is little above the sea, so that at high-water level it appears as a line of low islands.

The interior of the island is thinly populated owing to the many marshes, and almost entirely uncultivated. On the eastern side the soil is rich and fertile, and on the northwestern coast are meadow lands.

About two-thirds of the population are Esthonians, the remainder being Germans and Swedes. They are employed in cattle-raising, agriculture, fruit and vegetable cultivation, fishing, seal fishing, ship-building, cloth manufacturing, and lime burning.

The trade of Dagö is unimportant and is carried on through the small ports of Hohenholm and Tiefen Hafen. The chief articles of trade are grain, lime, and wood.

Southwestern coast.—The coast from Toffri Point, the southwestern extremity of Dagö, trends in a northerly direction 12 miles to Dager Ort Peninsula, which projects thence 10 miles to the westward. The coast is nearly everywhere low, of sandy loam, with swamps here and there; only eastward of Tumista Village are some sand hills; the numerous bights are shallow and full of rocks. Between Toffri Point and Khalti Point, $6\frac{1}{2}$ miles northward of it, foul ground extends 2 to 5 miles from the shore.

Shoals.—In the center of the bay northward of Khalti Point lies a large rocky shoal named Khundstik, part of which is nearly awash; from the center of this shoal Dager Ort (rear) Lighthouse bears 312° , distant 6 miles.

About $3\frac{1}{2}$ miles 282° from Khundstik, and $2\frac{1}{2}$ miles from the shore to the northward, lies the Neupokoeva Bank, with $1\frac{1}{2}$ fathoms of

water, from which the rear lighthouse bears 348° , distant nearly 5 miles. The soundings in the bay vary from 3 to 6 fathoms, but there are many shoals, having depths upon them of 3 to 9 feet, and no stranger should enter it.

The coast of Dager Ort Peninsula westward of this bay should not be approached nearer than 3 miles until abreast Kallana Village, when anchorage may be obtained in a depth of 9 to 10 fathoms, about 1 mile from the shore, with Dager Ort (rear) Lighthouse bearing 77° and Ristna Lighthouse 352° . At this village there is a coast guard station.

South Ristna Point, the southwestern extremity of Dager Ort Peninsula projects 450 yards, and is steep, wooded, and partly composed of rock; and North Ristna Point, nearly 1,800 yards northward, is narrow, low, and terminates in a sandy spit, which projects nearly 400 yards from the line of coast, and has a small hill on it, which appears as an island from seaward. Abreast both these points, extending about a mile from the above, lie rocky shoals, near the edges of each of which two black and white spar buoys are moored, which have topmarks of two black brooms, bases toward each other.

Neupokoeva Shoal—Buoy.—A narrow projection from the bank of less than 10 fathoms, which borders the shore, extends westward abreast South Ristna Point to a distance of 7 miles from the point, with several patches on it. On the outer part of this bank at $6\frac{1}{2}$ miles, 257° from South Ristna Point, lies the outer Neupokoeva Shoal, with $4\frac{1}{4}$ fathoms, marked on its western edge by a black and white spar buoy with a top mark of two black brooms, bases together. A depth of 17 fathoms lies a short distance southward of the shoal.

About $\frac{3}{4}$ mile northeastward of the shoal is a patch of $4\frac{3}{4}$ fathoms, marked on the northern side by a white spar buoy with black down-turned broom, in 7 fathoms, and the inner Neupokoeva, with 5 fathoms, marked on the northern side by a white spar buoy with black down-turned broom over a ball, in 8 fathoms, lies $2\frac{3}{4}$ miles east-northeastward. Grivtsova, with $5\frac{1}{2}$ fathoms, marked on the southern side by a red spar buoy with upturned broom in 8 fathoms, lies $\frac{3}{4}$ mile eastward of the outer Neupokoeva, and Durakina, with 5 fathoms, marked on the southwestern side by a red spar buoy with upturned broom over a ball, in 8 fathoms, lies 2 miles westward of South Ristna Point.

Life-saving.—There is a lifeboat station at Kallana, and a rocket station at South Ristna Point.

Lights—Upper Dager Ort.—On a hill near the middle of Dager Ort Peninsula, 5 miles from the western end of Dagö, stands a white square stone tower, 112 feet high, from which, 334 feet above the sea, is exhibited a flashing white light. (For details see Light List.)

Lower Dager Ort.—On North Ristna Point, from a red circular tower, 83 feet high, a fixed red electric light is exhibited 118 feet above the sea. (For sector see Light List.)

Fog signal.—During thick and foggy weather a siren on North Ristna Point is sounded. If the siren is disabled a bell is rung. (See Light List.)

Ice signals.—In the event of the visible expanse from Upper Dager Ort, Takhkona, or Pakerort being covered with ice, a ball will be hoisted at the Lower Dager Ort by day, and the fixed red light shown from the Lower Dager Ort Lighthouse will be altered to occulting red. (For details see Light List.)

Signal station.—There is a semaphore and signal station, also a telephone station, at North Ristna Point, where International Code Signals are received. The lighthouses at Upper and Lower Dager Ort are connected by telephone.

Northwest coast of Dagö.—The northwest coast of Dagö and the off-lying shoals, as far as Takhkona Point, will be described in H. O. Publication No. 143, Baltic Pilot, Vol. II.

Takhkona Light.—On Takhkona Point, the northern extremity of Dagö, stands a white iron tower, 130 feet in height, from which is exhibited, at an elevation of 140 feet above the sea, a fixed white light. (For sector see Light List.)

Life-saving.—A lifeboat and rocket apparatus are stationed at Takhkona Point.

Takhkona Point—Buoy.—A spar buoy with a down-turned broom is moored about 3 miles 30° from Takhkona Point and about $\frac{1}{2}$ mile northward of the $3\frac{3}{4}$ -fathom depth on the northern extremity of the shoal ground, which extends for about 3 miles from the shore to the northward of Simperness.

Serbina Bank, with depths of 7 to 18 fathoms, and 25 to 35 fathoms close around, lies 9 miles north-northeastward from Takhkona Point; this bank is 2 miles long east and west and 1 mile broad.

Apollon Shoals consist of two rocky heads, 1,400 yards apart east-southeast and west-northwest from each other, the western head has a depth of $3\frac{1}{2}$ fathoms and the eastern $2\frac{3}{4}$ fathoms; from the latter Takhkona Point Lighthouse bears 230° , distant $11\frac{1}{2}$ miles. The northwestern edge of Apollon Shoals is marked by two white spar buoys, each with a black down-turned broom, and the southeastern by two red spar buoys with upturned brooms. About $\frac{1}{4}$ mile south-westward of the eastern shoal is a patch of 5 fathoms.

Coast.—The northern end of Dagö is formed by Simperness (Simpenäs), which projects about 4 miles northward, with a width of about $3\frac{1}{2}$ miles; Takhkona Point, its northwest extremity is marked by a lighthouse previously described, and Cape Lechtma (Lekhtma),

the northeastern extremity by a beacon. There are landing places for boats at Takhkona Point and Cape Lechtma.

From Cape Lechtma the coast trends southward for about 4 miles, then eastward for about $7\frac{1}{2}$ miles to Serots Point, and is moderately high and wooded; it forms a bay, in which are numerous shoals extending some distance from the shore.

Lechtma (Lekhtma) Beacon, on the cape of that name, is a red and white horizontally striped tower with battlemented top, 50 feet above the sea and 45 feet above the ground; it serves to facilitate the approach of vessels of small draft desirous of obtaining shelter from westerly winds under the coast of Dagö. To vessels bound southward to Tiefen Hafen it is obscured by trees when bearing 288° , giving warning of Schmit Grund.

Anchorage.—During west and southwest winds small vessels may obtain sheltered anchorage in a depth of about 6 fathoms, fine sand, on the eastern side of Simperness, with Kertel Factory chimney bearing 193° , and Lechtma Beacon 291° .

Kertel Approach—Dangers.—The approach to Kertel, situated $4\frac{1}{4}$ miles south-southeastward of Cape Lechtma, lies between numerous rocks and shoals. A shoal of $1\frac{1}{4}$ fathoms lies on the eastern side of the line of range beacons, at $2\frac{3}{4}$ miles from the front beacon, and is marked by a black and white spar buoy with two black brooms bases together.

A rock with a depth of 7 feet over it exists close to the eastward of the line of Kertel Range Beacons at a distance of nearly 2 miles from the front beacon. The position is marked by a spar buoy, with a top mark of two flags.

A rock, with a depth of 9 feet over it, exists close to the line of Kertel Range Beacons, $\frac{1}{2}$ mile from the front beacon. One of 11 feet $\frac{3}{4}$ mile from the front beacon and close eastward of the range line is marked by a spar buoy with two flags. For other shoals see the chart.

Beacon.—Kertel Beacon, in the form of a tower, is painted in black and red horizontal bands; it is 89 feet above the sea, 44 feet above the ground, and stands on a hillock nearly a mile south-southeastward of Kertel Point.

Range beacons.—The approach to Kertel is marked by two range beacons standing eastward of the town. The front beacon, 10 feet high, is a white triangular shield, base upward; the rear beacon, 20 feet high, is red and shaped like an hourglass. In line bearing 162° they lead to the anchorage in the road.

Range lights.—Two fixed white range lights are shown from the range beacons just described. The front light is elevated 19 and the rear light 42 feet above the sea. Shown only at the request of vessels, signified by firing rockets.

Another pair of range lights are shown; the front light, fixed white, elevated 8 feet and visible 1 mile, is shown from a post at the end of the large pier. The rear light, fixed red, elevated 21 feet and visible 3 miles, is shown from a post on shore nearly 600 yards 224° from the front light. Shown when steamers are expected.

Pilots meet approaching vessels, on demand, off Lechtma Beacon.

The channels to the anchorage has a depth of 14 feet and is marked by buoys and range lights, but should not be used without local knowledge.

Kertel.—There is a pier at Kertel, with a depth of 8 to 9½ feet near the end, where good fresh water may be obtained. Small vessels may load and discharge cargoes abreast the warehouses of a factory, the chimney of which can be seen from the Apellon Shoals.

Repairs.—There are iron foundries and workshops at Kertel.

Supplies.—Coal and provisions can be procured here.

Life-saving—Telegraph.—A lifeboat is stationed at Kertel; there is a telegraph station here.

Anker Grund, with several rocks above water, situated 5½ miles eastward from Cape Lechtma, lies on the northwestern end of a flat extending nearly 7½ miles in a northerly and westerly direction from Serots Point. On the northeastern extremity of this flat, about 1½ miles eastward of Anker Grund, lies a rocky shoal named Neupokoeva, and about 1 mile east-northeastward of this shoal lies the Bes Grund, with 6 feet water, the northeastern side of which is marked by a red and white spar buoy with two red brooms, bases apart.

A spar buoy with down-turned broom has been established on the northern side of the 5-fathom depth, which lies about 1.2 miles northward of the north rock of Anker Grund, and a spar buoy with two brooms, bases together, is moored on the northeastern side of the 3-fathom depth, which lies about 2 miles westward of the same rock.

Tiefen Hafen.—From Kertel the coast trends in an easterly direction 2½ miles to Cape Giessar, on which there is a beacon, consisting of a stone pyramid with square iron latticework screen on top, 54 feet high and 57 feet above the sea, thence southeastward for 2½ miles to Tiefen Hafen. The bay is bounded on the west by Schmit Grund (parts of which are nearly awash), and Vasiholm, an island on the extreme of the flat extending from Cape Giessar; and on the east by the flat extending northward from Serots Point.

In the outer part of this bay, between Vasiholm and Kakör, 3½ miles eastward of it, good anchorage may be obtained in a depth of 5 or 6 fathoms, mud, with Palukiul Church in line with the beacon on Cape Giessar bearing 229°, and Serots Point bearing 148°. This anchorage is sheltered from all winds except those from the northwestward.

The inner part of the bay abreast Serots Point has a depth of $3\frac{1}{4}$ to 4 fathoms, but should not be used without local knowledge. At the head of the bay there is an island named Saddamalide, within which lies Tiefen Hafen; this harbor can only accommodate a few small vessels; it has a wharf and large storehouses for grain.

Beacon.—On the southern shore of the bay, 1,600 yards southwestward of Serots Point, stands a white pole beacon supported by four stays, with round shield on top; the top of the beacon is 40 feet above the sea and 34 feet above the ground.

Two large rocks, painted white on the outer side, lie 2° and 353° from the beacon, and in line with it, bearing 182° and 173° , respectively, mark the limits of the safe channel to the inner part of the bay.

Life-saving.—There is a lifeboat at Tiefen Hafen, and another at Cape Giessar.

Directions.—Vessels bound to Tiefen Hafen from the northwestward after passing Apollon Shoals should bring Palukiul Church, which stands on a hill about $1\frac{1}{4}$ miles southwestward of Cape Giessar, to bear 180° and steer for it on that bearing, which will lead westward of Anker Grund in a depth of not less than 3 fathoms; and when the clump of trees on the southwestern end of Wormsö is seen over Kakör, bearing 117° , it should be steered for on that bearing, until Palukiul Church bears 220° , and is in line with the northwestern end of a wood on the shore, when a course 180° will lead to the before-mentioned outer anchorage.

Vessels from the eastward should, when southward of Bes Grund, steer with Palukiul Church just open northward of the beacon on Cape Giessar; this mark leads over the flat northward of Kakör in $2\frac{1}{2}$ fathoms least water, but close to the shoal spit extending northward from Kakör, marked by a white spar buoy with black down-turned broom, in a depth of 9 feet.

Landmarks on eastern side of Dagö are, Pigalen Church, a mill at Grossenhof Farm, and an inn with red roof at Gelterma.

Port Gelterma, on the eastern coast of Dagö, $7\frac{2}{3}$ miles southeastward of Serots Point, has a depth of 14 feet in the harbor. There is a landing pier at which the depth is from 5 to 13 feet; there is a small crane on the pier. In the neighborhood of the pier there is anchorage in from 9 to 12 feet, unsafe in easterly winds. There is a private landing stage with a depth of 9 feet.

From Gelterma, roads lead toward the western and northern coasts of Dagö, as far as the upper Dager Ort Lighthouse, and to Serro on Sele Sund, but owing to the swampy ground they pass over they are generally defective.

From Port Gelterma there is communication with Hapsal by steamer in summer.

A small quantity of coal is stored here.

Lights.—Two fixed white range lights are shown at Port Gelterna Pier when the steamer is expected. They are elevated 10 and 35 feet above the sea, and are shown from white columns 9 and 17 feet high, respectively, the front column having a triangle, point down, and the rear column two triangles, points together; the front light is visible 3 and the rear light 6 miles in clear weather.

The lights are 56 yards apart and in line bear 253° .

To reach the landing place, keep the inn with red roof just open to the left of a farmhouse lying westward of it, bearing 252° , which leads between a shoal of 2 feet to the north and one of 6 feet to the south. At night the lights in line lead to the pier.

Wormsö and Möön Sunds lead from the Gulf of Finland to the Gulf of Riga, but as this route should only be used by small vessels with local knowledge a brief description will suffice.

Navigable depths.—Wormsö Sund lies between Dagö and Wormsö, and Möön Sund and between Möön and the coast of Esthonia; the length of these sunds from the northern end of Wormsö to the southern extremity of Möön is 35 miles. The northern entrance to Wormsö Sund, between Bes Grund and Stapelbotten Reef, is $3\frac{1}{2}$ miles wide, with depths of 7 to 10 fathoms, decreasing to $5\frac{1}{2}$ fathoms in the narrowest part between Gräsör and the southwestern point of Wormsö; this part of the sund is 2 miles wide, but the navigable channel is contracted to about $\frac{1}{2}$ mile by the shoals extending from these islands.

In the widest part of the sunds, between Wormsö and Möön, there are depths of 4 to 5 fathoms, mud, for a distance of 9 miles, but near the shoals on either side the bottom consists of sand and occasionally rocks. The navigable channel of Möön Sund, northeastward of Möön, is very narrow, with $2\frac{1}{4}$ fathoms least water.

Between Möön and Dagö, on the western side of Wormsö Sund, lies Kassar Bay, which with Sele Sund connects Wormsö Sund with the Baltic; on the eastern side abreast the northern end of Möön lies Matsal Gulf, extending about 12 miles inland, with depths of 8 to 10 feet in the outer half.

About 11 miles northward of this gulf there is a shallow inlet, on the southern side of which stands the town Hapsal, off which, distant $1\frac{1}{2}$ miles, vessels of 9 feet draft can anchor.

In summer, during continuous easterly winds, the water frequently falls 18 inches below mean level, when only vessels of very light draft can navigate this inlet.

Current.—The current in Wormsö and Möön Sunds invariably runs from north to south, and in the narrows, near Gräsör, at times attains a rate of $1\frac{1}{2}$ knots. The current from the Gulf of Riga, caused by the south and southwest winds, does not generally extend beyond

the northern end of Möön. The current from the north is strongest with northwest and northeast winds. The water in the sund generally rises with westerly winds.

Ice.—During winter a solid belt of ice surrounds Ösel and Dagö. Along the shores of Wormsö and Möön Sunds ice appears at the beginning of November, and with calm weather much earlier, but the sund is only occasionally covered with solid ice; this, however, does not occur before December, and does not last long. Generally the ice breaks up several times during the winter, with strong winds and moderate frost. In the northern part of these sunds the channel, as a rule, is free from ice in the month of May, and in the southern part as early as the middle of April.

Wormsö, between Dagö and Nukke (Nakkö) Peninsula, 8 miles long east-southeast and west-northwest, and $4\frac{1}{2}$ miles across, is low, wooded in some parts, and surrounded by reefs.

There is a landing pier with a depth of 4 feet southward of the lighthouse on Wormsö, but there is no good anchorage off it on account of the rocky bottom. At Pherby (Ferbyu) Village there is a landing place for boats.

The inhabitants of the island are mostly Swedes and are engaged in agriculture, cattle raising, and fishing.

Wood, water, and fresh provisions can be obtained from Wormsö.

Landmarks.—The principal landmarks on Wormsö are: Saxbiness Lighthouse; Wormsö Beacon; the guardhouse at Pherby (Ferbyu), on the west coast; a large mill at Magnushof; Olai Church, near the middle of the island; Eadö clump of trees on Hofholm at the southwestern end; a white warehouse with red roof at Relbi; and a wood on Borbyholm (Borbiholm), on the northern side of the island.

Wormsö Beacon.—About 300 yards southward of Saxbiness Lighthouse, and near the lifeboat station, is a triangular wooden beacon, base downward, surmounted by a disk 20 feet above the ground. The disk and the upper half of the beacon are covered with horizontal open planks.

The beacon and lighthouse in line bearing 3° lead between Stenskar and the shoal on the eastern side of Gräsör.

Fries Grund.—From the northwestern extremity of Wormsö a flat, with a depth of 12 to 18 feet, extends $3\frac{1}{2}$ miles in a northerly direction, having near the middle a rocky shoal with 3 feet water named Fries Grund; a black and white spar buoy with two black brooms, bases together, is moored 1.1 miles westward from Fries Grund on the western edge of the flat.

Saxbiness Light.—On Saxbiness, the northwestern point of Wormsö, stands a white circular iron lighthouse 72 feet high, from which, 88 feet above the sea, is exhibited a fixed white and red light.

The red sector marks the fairway entrance from the northward to Wormsö Sund. (For sectors see Light List.)

There is a telephone station at Saxbiness, communicating with Hapsal.

Life-saving.—There is a lifeboat station southward of Saxbiness Lighthouse and also near Kerslat Ness, the northern extremity of Wormsö.

Stapelbotten Reef, situated $2\frac{1}{4}$ miles northward of Fries Grund, is separated from the shore flat by a channel two-thirds of a mile wide, with a depth of $3\frac{1}{4}$ to 4 fathoms; the reef extends 2 miles in a northwest direction, and is three-quarters of a mile in width. Near the northern extremity of this reef there is a cluster of rocks, some of which are covered by only 1 foot of water, and there are other shoal spots of 3 feet and 1 fathom.

Buoys.—The northwestern edge of Stapelbotten Reef is marked by two white spar buoys, each surmounted with a black down-turned broom.

Shoals.—At $1\frac{1}{4}$ miles 279° from the rocks at the northern end of Stapelbotten lies a rocky shoal a quarter of a mile in extent, with $2\frac{1}{2}$ fathoms least water, and depths of 7 to 10 fathoms close around; its north, south, east, and west sides are marked by spar buoys with their appropriate broom top marks. Takhkona light is obscured over this shoal and Stapelbotten Reef.

At about $1\frac{1}{4}$ miles northward of the above shoal there is a small bank named Merlin, with depths of $4\frac{1}{2}$ and 5 fathoms, and 9 to 10 fathoms close around.

Pletseva Bank, about 3 miles north-northeastward of Stapelbotten Reef, has a least depth of $4\frac{1}{2}$ fathoms, with from 6 to 10 fathoms around.

A shoal with $3\frac{1}{2}$ fathoms lies on the northern edge of the red sector of Saxbiness Light, about 2 miles southwestward of the southwestern edge of Stapelbotten Reef, and 4.1 miles 329° from the lighthouse.

Light buoy.—A red light buoy, showing a flashing white light every 6 seconds, is moored northwestward of Stapelbotten Reef, on the Intersection of the eastern limit of the sector of red light shown from Saxbiness Lighthouse, with the southern limit of the arc of visibility of Takhkona Point light, at a distance of $7\frac{1}{4}$ miles 328° from Saxbiness Lighthouse.

Salt Grund (Stein-sher).—From the southwestern extremity of Wormsö a flat extends $1\frac{1}{4}$ miles westward, on the edge of which lies Stenskar, with 2 feet water; at a short distance southward of this reef lies the Salt Grund, which dries at low water.

Light and bell buoy.—A black light and bell buoy showing a fixed red light, surmounted by two black brooms, bases together, and

equipped with four small bells, is moored in a depth of 28 feet west-southwestward of Stenskar.

Buoys.—Off the western side of Stenskar there is a black and white spar buoy, with topmark of two black brooms turned bases toward each other. Near the southwestern edge of the flat there is a red spar buoy with upturned broom, 1,400 yards south-southwestward of Salt Grund. About $1\frac{3}{4}$ miles northward of Stenskar, abreast Pherby, a black and white spar buoy, with two black brooms, bases together, is moored in $5\frac{3}{4}$ fathoms.

Ruke-raga Islet lies $3\frac{1}{4}$ miles southward of the southern extremity of Wormsö and on the southern side of one of the approaches to Hapsal. It is marked by a beacon consisting of a white four-sided pyramid surmounted by a black square of open boards.

Kuiva-raga, situated on the eastern side of the widest part of the channel leading from Wormsö to Möön, is nearly 3 miles long, with several rocks above water; between the southern end of this reef and Semmery Island lies a channel leading to Hapsal. The southern end of Kuiva-raga is marked by a red spar buoy with upturned broom.

Kumorskia Bank, with 6 feet water, lies near the southern part of the wide channel leading to Möön Sund; the western side of this bank is marked by a light and bell buoy and two black and white spar buoys surmounted by two black brooms, bases together, moored in a depth of $3\frac{1}{2}$ fathoms.

Kumor Light and Bell Buoy.—A white light buoy, marked "K" in black, surmounted by four small bells and a red broom, and exhibiting a flashing white light giving from 15 to 20 flashes every minute, is moored at the western end of the northern patch of the Kumorskia Bank, on the eastern side of the channel.

Kumora, the largest of a group of islands lying northeastward of Möön, distant $6\frac{1}{2}$ miles from the northern extremity of that island and 3 miles westward of Cape Puisunina, the northern entrance point to Matsal Gulf, has on it a red beacon 40 feet high, surmounted by an inverted cone. From the western end of this group a rocky bank named Kumorsky Reef extends $4\frac{1}{2}$ miles in a southerly direction; the southwestern edge of this bank is marked by a black and white spar buoy, surmounted by two black brooms, bases turned together, over a black and white ball, and 1.3 miles north-northwestward is a similar buoy, but without a ball.

Gräsör (Harry Island) (Kharilaid or Grezera) is a narrow island $\frac{3}{4}$ mile long, north and south, on the western side of Wormsö Sund, surrounded by an extensive rocky flat, the northern edge of which is marked by a white spar buoy with black down-turned broom, and the eastern edge by three red and white spar buoys, each with two red brooms, bases apart. Near the southern extremity of Gräsör stands a

beacon 42 feet high, and when in line with the mill, 329° from it, leads between Salt Gruud and Erik Rock.

Gräsör (Kharilaid) Light.—Near the southern extremity of Gräsör an alternating white and red light is exhibited 14 feet above the sea. (For details see Light List.) The light structure, about 5 feet high, is a white house with black roof.

This light indicates the channel into Möön Sund from the northward and from the southward its western limit leads eastward of Erik Rock.

Erik Rock (Kings Stone), above water, lies about 3 miles 164° from the southern end of Gräsör and the same distance eastward from Dagö, near the edge of the 3-fathom curve extending from that island; it is surrounded by an extensive, shallow rocky flat, the southeastern edge of which is marked by a red and white spar buoy with two red brooms, bases apart, moored abreast a patch of 5 feet. Gräsör Light is obscured over Erik Rock.

Getland (Heinlide) (Kheinlaid) Island lies about $1\frac{1}{2}$ miles eastward of the southeastern point of Dagö. About $1\frac{1}{2}$ miles southward of Getland is the small islet, Langekara (Langekari), with one tree on it.

Keverilaid or Krukholm is the easternmost of several small islands in the channel between Möön and Dagö. It is covered with a plantation, and lies $2\frac{1}{2}$ miles west-southwestward from Kumorskia Bank. About 2 miles east-southeastward of Keverilaid lies a rocky shoal with 6 feet water named Unterneman, the eastern side of which is marked by a red and white spar buoy surmounted by two red brooms, bases turned apart.

About $2\frac{3}{4}$ miles northeastward from Keverilaid is a shoal of $2\frac{1}{2}$ fathoms, named Stvornaya, marked on its northeastern side by a red and white spar buoy with two red brooms, bases apart.

Rauga Light and Bell Buoy.—A fixed white light is exhibited from a white light and bell buoy, surmounted by a black broom and 4 small bells, moored 1.2 miles 343° from Möön Island from a range light, on the line of the lights and near a patch of $2\frac{1}{2}$ fathoms. Withdrawn about October 28 and replaced by a white spar buoy with black broom.

Kassar Bay.—The eastern approach to Kassar Bay lies about $1\frac{1}{4}$ miles to the northward of Möön Island, and carries a least depth of $2\frac{1}{2}$ fathoms over the flat stretching from Keverilaid and Akkilaid Islands to Möön. The fairway is marked on the northern side by red spar buoys with upturned brooms; the shoal extending from the northwestern side of Möön is marked by a white spar buoy with black broom turned downward. The general depths over the greater part of the bay are from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, mud.

Two shoal patches on the northern side of the middle part of Kassar Bay, having a depth of 6 feet or less, are each marked on their southern edges by red spar buoys with upturned brooms; the reefs off Terkma Village, on the south side of Dagö, are also marked by spar buoys.

Life-saving.—There is a life-saving station at Soela, southwestern side of Kassar Bay, $1\frac{1}{2}$ miles southeastward of Pamerr Ort.

Möön is separated from Ösel by a shallow channel 1 to 2 miles wide, and from the mainland by Möön Sund, which is about 3 to 5 miles wide; the navigable channels, however, are much contracted by numerous rocks and shoals. The island is 66 to 80 feet high, 11 miles long northwest and southeast, 6 to 9 miles broad, and wooded in some parts. St. Catherine (Ekaterina) Church, near the center of the island, the Kuivast Village, with its guardhouse and lifeboat station on the eastern shore, can be seen from a considerable distance.

There is a wharf at Kuivast for the ferry which runs to Werder.

Kuivast is connected with Werder Peninsula, on the opposite shore, by a telegraph cable, the position of which is marked by 6 black spar buoys, with white upturned brooms. On the western side of the island a cable crosses from Vakhtna to Orrisar on Ösel, and is marked by 3 similar buoys to the above. Vessels are forbidden to anchor near these cables.

Shoals—Buoys.—The edge of the shoal water extending from the northeastern point of Möön is marked by three white spar buoys, each with a black down-turned broom; the narrow channel eastward of this shoal is bounded on the northeastern side by a reef with $1\frac{1}{4}$ fathoms on it, lying southward of Kumorsky Reef, and marked on its southwestern side by a red spar buoy with up-turned broom in 3 fathoms, and on its southeastern end by a similar buoy in 6 fathoms: the Shiljdau Lights are obscured over this shoal.

The shallow water on the eastern side of Möön, 3 miles northward of Kuivast, extends $1\frac{1}{4}$ miles from the shore, and on its edge there is a shoal with $1\frac{1}{4}$ fathoms of water, marked on its eastern side by a red and white spar buoy with topmark of two red brooms, bases turned asunder, moored in a depth of $3\frac{1}{2}$ fathoms.

From the southeastern part of Möön a rocky shoal extends eastward $1\frac{1}{2}$ miles, southeastward $2\frac{1}{4}$, and southward $3\frac{1}{4}$ miles. Vireland (Virelaid) or Paternoster Island lies on the outer part of this reef, eastward of the southeastern point of Möön, and on the part extending southward from Möön are Wailaid (Voilaid) Island about 1 mile in extent, and Piouchadekarre (Pyukhadekarre), an islet near the extremity of the reef. Eastward of the reef and in mid-channel are patches of $3\frac{1}{2}$ to 5 fathoms.

A white spar buoy with black down-turned broom is moored in 6 fathoms off the northeastern edge of the reef $\frac{3}{4}$ mile 14° from the

eastern end of Vireland Island. About 2 miles southward of the eastern end of Vireland, off the edge of the shoal and southeastward of some rocks that dry at low-water level, a red and white spar buoy surmounted by two red brooms, bases apart, is moored in a depth of 6 fathoms.

Life-saving.—There is a lifeboat station at Kuivast, and also at the range lights on the northeastern coast. There are ice boats at Vakhtna, and at Orrisar, opposite.

Lights.—On the northeastern coast of Möön Island, two range lights are exhibited from iron openwork beacons, 73 and 87 feet high, respectively; the southern beacon is red, the upper half of the northern is red and the lower half yellow. The lights are fixed white, placed 574 yards apart, and when in line bearing 163° lead through the navigable channel between Kumorskia and Unter-neman Banks.

The front (northern) light is elevated 83 feet, and the rear light 117 feet, above the sea.

A fixed white light, elevated 25 feet, is occasionally shown from the pier at Kuivast.

Paternoster Light.—From an iron lighthouse, 36 feet in height, painted dark gray, on the northeast point of Vireland (Vireland) or Paternoster Island, a flashing and group flashing light with white and red sectors is exhibited. The light is elevated 46 feet above the sea. (For details and sectors see Light List.)

Fog signal.—During thick and foggy weather a bell is sounded.

Shiljdau (Shildau), a small island situated midway between Möön and the mainland, has on its western end a white openwork beacon, 47 feet above the sea and 38 feet above the ground, situated 747 yards 303° from the eastern light beacon; by day, these beacons in line lead through the narrow channel between Möön and Kumorsky Reef.

Light and bell buoy.—About $1\frac{1}{2}$ miles southward of Shiljdau Island there is a shoal with $1\frac{3}{4}$ fathoms of water, the western side of which is marked by a white pyramidal buoy, surmounted by two black brooms turned bases together, exhibiting a fixed white light and equipped with four small bells; moored in a depth of 6 fathoms.

Lights.—On the western extremity of Shiljdau (Shildau) Island, an alternating flashing light is exhibited from a small red structure at the white beacon at an elevation of 11 feet above the sea. (For details and sector see Light List.) The light is exhibited during the whole of the navigable season.

From a gray square tower, 48 feet high, on the southwestern side of Shiljdau, a fixed white light is exhibited, at an elevation of 53

feet above the sea. (For sector see Light List.) The lights in line bearing 123° lead between Mön and Kumorsky Reef.

Werder (Verder) Light.—On the western extremity of Werder (Verder) Peninsula stands an iron tower, 83 feet high, painted red, from which, at an elevation of 94 feet above the sea, is exhibited a fixed white light. (For sector see Light List.)

Occasional range lights.—Range lights are shown from Werder Island Pier when required at the time when communication is being kept open by ice breakers.

Telegraph station.—Werder Farm is a telegraph station. The lighthouse on the west point is in telephonic connection with the general system for transmission of messages in the Russian language (exclusively).

Life-saving.—There is a lifeboat station at Werder Lighthouse.

At the northern end of Werder (Verder) there is a coast guard and a customhouse; also a building yard for small vessels.

Anchorage.—There is anchorage in the southern entrance to Mön Sund, between Kuivast and Werder, in $6\frac{1}{2}$ to 9 fathoms, mud. Farther north, between Kuivast and Shiljdau, the holding ground is good and the depth sufficient, but the space is contracted and the current stronger.

Off Kuivast, vessels of 12 to 15 feet draft can anchor $\frac{1}{2}$ mile southward of the ferry landing place, with Paternoster Lighthouse bearing 149° , and the guardhouse at Kuivast 270° ; the telegraph cable must be avoided.

Off Werder, there is anchorage in $2\frac{3}{4}$ fathoms southward of the parallel of the large farmhouse, with Sarcots Point bearing 180° . Small vessels drawing 6 feet can approach nearer to the landing place into the harbor sheltered by the Kibbolaid Islets.

Directions—Wormsö Sund.—Vessels bound into Wormsö Sund, after passing Apollon Shoal, should bring Eadö Clump open westward of the plantation south of Saxbiness bearing 148° , and steer for it on that bearing until Palukiul Church is seen open southward of Kakör, when a 164° course should be steered until Saxbiness Lighthouse and the beacon southward of it are in line bearing 3° , which mark, astern, will lead through the narrows between Gräsör and the reefs extending from the southwestern point of Wormsö.

Or, steer toward Saxbiness Lighthouse on a 140° bearing until Palukiul Church is in line with the northern end of Kakör bearing 241° , and the Fries Grund Buoy is on the port beam; then alter course to 163° until Saxbiness Lighthouse is in line with the beacon southward of it bearing 3° , which mark, astern, leads between Gräsör and Stenskar.

Anchorage may be obtained in any part of the sund, although in the widest part between Wormsö and Mön the sea is rough during

heavy gales. A good anchorage is in a depth of from 3 to 5 fathoms, mud, with the inn on Gräsör bearing 326° and Pherby (Ferbyu) Village on Wormsö between 25° and 36° .

Möön Sund.—If proceeding through Möön Sund to the Gulf of Riga, after passing Gräsör (Kharilaid) on a course 183° , with Saxbiness Lighthouse and the beacon southward of it in line astern, bring the beacon on the south point of Gräsör in line with the mill less than 200 yards northwestward of it, bearing 329° , which mark astern leads eastward of Erik Rock; when that rock is 3 points abaft the beam, steer 163° toward the Möön Island range beacons, and bring them into line on that bearing when sighted, which leads westward of Kumor Light Buoy, between Kumorskia and Unter-neman, and westward of the Kumorsky Bank Buoys, until the beacons on Shiljdau Island are in line near the Ranga Light and Bell Buoy, which is left to starboard, which mark will lead through the narrow channel northeastward of Möön in not less than $2\frac{1}{4}$ fathoms; when about $\frac{3}{4}$ mile from Shiljdau (Shildau) steer 163° for $2\frac{1}{4}$ miles, and when abreast the light and bell buoy, southward of Shiljdau, steer 155° to pass between Werder (Verder) Peninsula and Vireland (Virelaid) or Paternoster Island into the Gulf of Riga.

Approaches to Hapsal.—Hapsal can be approached from the northward by the channel between Wormsö and Nukké Peninsula, but it is so narrow and winding that the navigation is difficult even with local knowledge, assisted by the buoys. The inlet leading to Hapsal can only be used by vessels of light draft, and these usually pass through Wormsö Sund, and between the reefs extending from the southern shore of Wormsö. As local knowledge is necessary, no directions are given.

Navigable depths.—Vessels of less than 10 feet draft can pass through the narrow channel northward of Ruke-raga on which is a beacon. This channel is marked by spar buoys.

Vessels of 9 feet draft can pass through the channel between Kuiva-raga Reef and Semmery Island, which is marked by spar buoys, thence in a northerly direction through the channel which also is marked by spar buoys, to the anchorage in a depth of 15 feet at 3 miles westward of the town; vessels of 9 feet draft can anchor within $1\frac{1}{2}$ miles of the town.

Hapsal Harbor.—The inner harbor, eastward of the town, is sheltered from all winds and sea, but is only from 5 to 7 feet deep, and can only be used by small craft; larger vessels must anchor in the bay westward of the town or approach the new landing pier through the dredged channel. This pier extends westward from the north part of Marienholm, an island lying westward of and parallel to Burgermeisterholm, and can be used by vessels of 10 feet draft. From the pier a dredged channel 750 yards in length extends in a

252° direction; at the pier it is 93 yards wide and elsewhere 70 yards. A second channel, 187 yards long and 93 yards wide, begins 2,100 yards from the pier, and runs in an east and west direction. In both channels the depth is 10½ feet. The channels are marked.

Beacons.—To facilitate the approach to the pier two pairs of beacons are used, one pair on the pier, the other on a small island southward of the pier and on the land to the eastward.

Hapsal, a small town, lies at the inner end of a narrow peninsula on the southern side of the inlet, which extends eastward on the southern side of Nukké. Southwestward from the outer part of this peninsula, named Burgermeisterholm, and parallel with it is the island Marienholm, which is connected with the peninsula and the town by a dike. In the town are two churches and the ruins of a bishop's castle and an old church. Besides these the courts of justice, a two-storied yellow building with red roof, rises above the houses of the town and forms a good mark.

Communication.—There is regular communication by steamer between Riga, Arensburg, Pernau, Mõön Sund, Hapsal, Revel, and Petrograd (St. Petersburg) twice a week; also between Riga, Arensburg, Kuivast, Hapsal, and Port Baltic once a week, there and back. In summer a small steamer runs almost daily between Hapsal and Gelterna on Dagö. There is a telegraph station and a customhouse.

Trade.—The foreign trade of Hapsal is insignificant; salt is imported from England and herrings from Norway. The chief exports are grain and spirits.

Ice.—Navigation closes about November or December and opens in February or March.

Relbi Bay, situated on the northern shore of Wormsö, affords shelter for small vessels. It should not, however, be used without local knowledge. There are depths of 7 to 10 feet at the anchorage in this bay and 6 feet alongside the landing places. Grain is shipped to Finland.

Telnes Point, the northwestern extremity of Nukké Peninsula, has on it two gray stone beacons, 385 yards apart, 334° and 154° from each other. The front beacon is 23 feet high, with a white iron rectangular top mark. The rear beacon, 38 feet high, has a white round iron top mark. In line they lead eastward of Chernova, a bank with 3½ fathoms upon it, situated 9¼ miles northward of the northeastern end of Wormsö and between Savinova and Kolmakof (Kolmakova) Banks, with 8 and 6 feet of water, respectively, at the northern entrance to Wormsö Channel.

Coast.—From Nukké Peninsula the coast trends in a northerly direction 9 miles to Spithamn, with several outlying rocks and shoals. Rikholtz Farm with its red roofs, and Roslep Chapel, about 3 miles farther northward, are conspicuous; the latter is sometimes hidden

by trees, but from the northward and westward its white walls can be seen 10 miles off, through vistas in the forest, especially when the afternoon sun shines on them.

Dirhamn Point has a wooded sand hill on it. There is a landing place for boats on the northern side of the point.

Spithamn (Spint Head).—Spithamn is a low, sandy point, on the eastern side of which small vessels may obtain good anchorage during southwesterly winds, 1 to $1\frac{1}{2}$ miles east-northeastward from the five mills near and northward of the village, which lies south-eastward of the point. At the point is a guardhouse.

Spithamn—Shoals.—A shoal of 4 fathoms lies 1,800 yards northwestward of Spithamn, and is marked on its northern side by a black spar buoy with down-turned broom.

A shoal of $4\frac{1}{2}$ fathoms lies 2.6 miles 275° from Spithamn, with depths of 5 fathoms about 1,000 yards northeastward, and 800 yards westward of it, respectively. Spar buoys have been established to mark these shoals.

Odenholm, situated 4 miles northwestward from Spithamn, is $2\frac{1}{2}$ miles long northwest and southeast, $\frac{3}{4}$ mile across its broadest part, and moderately high; on the northern side are overhanging cliffs, 33 feet in height; near the middle of the island there are two windmills, and a church with a black steeple. As the wood on the northwestern side and in the middle of the island is very low, it appears as two islands at a great distance. A fresh-water lake on the island is connected with the sea at high-water level. Good drinking water is obtained from wells. The inhabitants are mostly fishermen, and can conduct vessels to Port Baltic, Möön Sund, and Hapsal. A tree on a hill southeastward of the church shows up well from seaward.

Boats can land in a small bay southeastward of the church, where there is a fish warehouse and where the boats of the inhabitants lie.

The northwestern extremity of Odenholm is steep-to, the water deepening suddenly from 10 to 25 fathoms, and at 2 miles west from the lighthouse there is a depth of 50 fathoms.

A narrow bank of sand, on the outer part of which the soundings are from 13 to 15 fathoms, with 20 to 44 fathoms around, extends $2\frac{1}{4}$ miles northward from the northwestern end of the island.

From the southeastern point of the island a rocky flat extends nearly $2\frac{1}{2}$ miles in the direction of Spithamn on the southern extremity of which there is a rock with 9 feet water, named Sundschtein; its southeastern side is marked by a red spar buoy, with up-turned broom, and to the southward of this buoy there is a clear channel with a depth of 7 to 10 fathoms. About $\frac{1}{2}$ and 1 mile, respectively, northwestward of Sundschtein Rock, there are two shoals of $2\frac{1}{4}$ fathoms; the passage between Odenholm and Sundschtein Rock is closed.

Light.—From a circular lighthouse, 94 feet in height, painted in black and white horizontal bands, on the northwestern point of Odensholm, a group-flashing white electric light is exhibited, 115 feet above the sea. (For details see Light List.)

In consequence of incorrect adjustment of the lenses, the light appears irregular in its action.

Telephone to Hapsal.

Fog signal.—During thick and foggy weather a fog siren is sounded; if the siren is disabled, a bell is sounded near the lighthouse. (See Light List.)

Anchorage.—South of Odensholm, anchorage may be obtained in a depth of 7 or 8 fathoms, with the church bearing 0° , distant about $2\frac{1}{2}$ miles. There is also anchorage nearer the island, but Sur Grund, a shoal of 5 fathoms lying $2\frac{1}{2}$ miles 166° from the lighthouse, should be avoided, as well as a 5-fathom shoal about $\frac{1}{2}$ mile south-eastward of it and 3 miles 160° from the lighthouse.

Life-saving.—Lifeboats are stationed at the lighthouse and at the southeastern point of Odensholm.

APPENDIX I.
Particulars of dry docks, patent slips, etc.

Port.	Name of dock.	Length.		Breadth of entrance.	Depth at high water ordinary spring.		Lifting power.	Date built.	Remarks.
		On blocks.	Over all.		On sill.	On blocks.			
		<i>Fet.</i>	<i>Fet.</i>	<i>Fet.</i>	<i>Fet.</i>	<i>Fet.</i>	<i>Tons.</i>		
Ystad.....	Patent slip.....	175		127	14	$\left\{ \begin{array}{l} 46 \\ 112 \end{array} \right.$	400	1883	Largest vessel docked, 225 feet long. At Windhamn.
Sölvesborg.....	Dry dock.....	280	285	45		$\left\{ \begin{array}{l} 24 \\ 110 \end{array} \right.$	200		
Karlshamn.....	Patent slip.....								
	(Government, old)			453					
	(Government, No. 1)	182	211	50	17½				
	(Government, No. 2)	253	272	50½	19½				
	(Government, No. 3)	192	218	46½	19½				
Karlskrona.....	Government, No. 4	203	228	46½	20				Karlshamn.—The length of docks over all is the same as the floor. Ternö boats are hauled up broadside on by electricity.
	(Government, No. 5)	209	227	46½	24½				
	(Government, Oscar II.)	390	410	68½	24½	$\left\{ \begin{array}{l} 12 \\ 11 \end{array} \right.$	480	1892	Largest vessel docked, 472 tons. Largest vessel taken up, 500 registered tons. Dock can take a vessel of 3,500 tons.
Nexö.....	Dry dock.....	170	170	30	12½				
Kalmar.....	Patent slip.....	195		160	15	15			
	(Oskarshamn Mekaniska Verktad, No. 1.)	344½	355	48½	8½				No. 2 dock is a recess in No. 1.
Oskarshamn.....	(Oskarshamn Mekaniska Verktad, No. 2.)	147	157	48½					(Vessels 171 feet long and from 300 to 400 register tons can be taken up. Can take a vessel of 1,000 tons.)
Västervik.....	Patent slip.....	150		130		$\left\{ \begin{array}{l} 19 \\ 114 \end{array} \right.$	500		
Norrköping.....	Motala Co.....	227	243	35½	22				
	Admiralty.....	325	358	58	23				
	Beckholmen, Västern.	325	340	52	17				
	Beckholmen, Västern.	321	340	52	13				
	Lindbergs pontoon (L. and S. type)	243		50		18	2,150	1886	Can be divided into two parts, 146 and 173 feet. In two parts 150 and 90 feet in length. Depth over blocks can be increased slightly in case of necessity.
Stockholm.....	Finnboda slip.....	1225				$\left\{ \begin{array}{l} 18 \\ 119 \end{array} \right.$	1,500	1878	Can take up a vessel 170 feet long, 24 feet beam, and 800 tons register.
	Bergsund slip, Mälaren.....	1136				$\left\{ \begin{array}{l} 19 \\ 29 \end{array} \right.$	430	1889	Another slip at Mälarsvarfvet can take up a vessel of 150 tons.
	Mälarsvarfvet slip, No. 1.....	1100				$\left\{ \begin{array}{l} 19 \\ 112 \end{array} \right.$	220		A slip at 1 öfholmsvarfvet can take up a vessel of about 75 tons. Can take a vessel of about 140 tons register.
	Pontoon dock.....	79							1 Aft.
									1 Forward.
									1 Cradle.

Particulars of dry docks, patent slips, etc.—Continued.

Port.	Name of dock.	Length.		Breadth of entrance.		Depth at high water ordinary spring.		Lifting power.	Date built.	Remarks.
		On blocks.	Over all.	Feet.	Feet.	On sll.	On blocks.			
Furueund, Hapshard-Stralsund.....	Patent slip.	1100		Feet.	Feet.			Tons.		{Can take vessel of 300 gross tonnage or 400 tons register. Messrs. Abrahams own a slip 131 feet long capable of taking vessels drawing 6 feet.
	Patent slip.	170		120	17		19	200		
	Patent slip.	170		120	17		17	200		
	Patent slip.	170		121	17		17	150		
Wolgast.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
Swinemünde.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
Stettin.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
Rostock.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
Danzig.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
Pillau.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
Eldburg.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
Memel.....	Patent slip.	131	120					150		{There are slips at Swinemünde suitable for vessels of 300 tons. In two sections. In five sections. In two sections, can be joined: largest vessel docked, 1,079 tons register. The two sections together have taken a vessel 280 feet long by 14 feet beam and 12 feet draft. A Grimsby vessel 229 feet long, 30 feet beam, and 9 feet draft. There is a slip at the Government yard.
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		
	Patent slip.	131	120					150		

Liberté.....	Government, No. 1.....	635	85	30	.....	.....	.....	(The body of No. 2 dock is 10 feet narrower at the top than that of No. 1.
	Government, No. 2.....	600	88	30	.....	1,400	.....	The floating dock is in four sections; it is not available for merchant vessels.
	Government, floating.....	259	43	.....	.....	.....	.....	The floating docks are at 17 around winter harbor, and can be used separately or together; they are capable of taking a vessel 300 feet long, 50 feet beam, and 17 feet draft.
	Floating dock.....	158	514	.....	.....	1,410	1898	Patent slip has taken a vessel of 2,000 tons, drawing 5 feet forward and 14 feet aft; it is said not to be in good repair.
	Floating dock.....	194	51}	.....	.....	940	1898	
Riga.....	Patent slip.....	1 212	70 {	.....	.....	.....	.....	

1 Cradle.

2 Aft.

3 Forward.

APPENDIX II.

List of principal ports, showing particulars of depths, &c.

Port.	Depth at low water ordinary spring in channel of approach.	Depth at low water ordinary spring in anchorage.	Rise of tide.	Remarks.
Åhus.....	(Eastern entrance, 20 feet at mean level. Northern channel, 12 feet draft. Southern entrance, 8½ feet draft.)	Northern deep, 4 fathoms. Hålan, 4 to 5 fathoms. Spanish road, 4 to 5 fathoms. Harbor, 19 feet. 5½ to 7 fathoms. 4 to 5 fathoms. 6 fathoms. 4 to 6½ fathoms. 3½ fathoms.	1 foot between mean and low levels.	Sheltered by shoals. Sheltered by shoals. Exposed.
Danzig.....	24½ feet. 3½ fathoms at lowest level.	5½ to 7 fathoms. 4 to 5 fathoms. 6 fathoms. 4 to 6½ fathoms.		Neufahrwasser Road. Northeastward of harbor. Northeastward of Nyckeln. Southeastward of Grimskaär. 1½ to 3½ fathoms in harbor. Northwestward of Karlsten.
Kalmar.....	33½ fathoms.	3½ to 6½ fathoms.	1 to 1½ feet between mean and low levels; 5 feet in exceptional cases.	
Karlshamn.....		18 to 26 feet in harbor at mean level. 3½ fathoms. 6½ to 7½ fathoms. 4 to 11½ fathoms. 2½ to 3½ fathoms. 1½ fathoms.		In Windhamn. Northward of Boon Island. Great Channel, Outer Road. Inner Road. Kottardrednen. Western entrance. Harbor in harbor up to 16 feet. Mandegar Road. Commercial Port. Winter Harbor. Old Harbor.
Karlskrona.....	7 fathoms.	6½ to 7½ fathoms. 4 to 11½ fathoms. 2½ to 3½ fathoms. 1½ fathoms.	2 feet between mean and low levels.	
Kolberg.....	15½ feet draft at mean level. 15 feet. 30 feet. 27 feet. 23 to 24 feet.	6 to 7 fathoms. 19 to 22 feet. 28 feet in south part. 22 feet. 19 to 22 feet.		
Libau.....	14½ feet at mean level.	3½ to 6½ fathoms. 10 to 12 fathoms.	2 feet between mean and low levels. 1 foot above and below mean level.	
Memel.....	20 feet.	3½ to 7 fathoms.		Road.
Neufahrwasser.....	19½ feet at mean level.	3½ to 8 fathoms.	3½ feet above to 2 feet below mean level.	Hafen Canal 2½ feet; Frelshafen 20½ feet.
Norrköping.....	17 feet at mean level.	17 feet.	1 foot between mean and low levels.	Pampas roadstead.
Nyköping.....	13 feet in southern entrance. 21½ feet draft by southeast and east entrance.	6 to 7 fathoms. 6 to 7 fathoms.	16 inches between mean and low levels.	In harbor. 18 to 29 feet in harbor.
Oskarshamn.....	23 feet draft by southeast and east channels. Deep.....	5½ to 10 fathoms. 6 fathoms in harbor. 18 to 20 feet in roadstead.		Eastward of Grimskaallen. 7½ to 20 feet along-side. 17 feet in river channel.
Orxelö Sands Hamm. Pernau.....	17 feet.	9 or 10 fathoms in road, 4 fathoms in See tief.	1 foot between mean and low levels. Difference in water levels 3 to 4 feet, caused by winds. 3 feet above and 3½ feet below mean level.	
Pillau.....	21½ feet in See tief.			3½ to 4½ fathoms in haven.

APPENDIX III.

RUSSIA.

REGULATIONS FOR VESSELS WHEN BEING CONDUCTED THROUGH THE ICE BY ICE BREAKERS.

1. Application by vessels to be conducted through the ice will be made if in port to the harbor master and if at sea to the captain of the ice breaker.

2. The harbor master, or, should the ice breaker be outside the limits of the port, the captain of the ice breaker, has the right to refuse an application to conduct the vessel to sea or to bring her into port if they consider that the vessel, as regards her construction, build, power of engines, equipment, or stowage of cargo, may be exposed to danger when in the ice.

3. The time and order of progression of vessels through the ice, as also the number of vessels to be conducted at one and the same time, will be determined by the captain of the ice breaker.

4. The captains of vessels following an ice breaker in the ice will be subject to the orders of the captain of the ice breaker as regards moving in the ice, and are to act in accordance with them.

5. Vessels following an ice breaker in the ice are to be guided by the undermentioned signals, which will be made by means of a whistle or hooter (megaphone). The signals, with the exception of No. VI, must be repeated in succession by the vessels being conducted, beginning with that nearest to the ice breaker if the signals are made by the ice breaker, and in the reverse order if they are made by one of the vessels.

6. Vessels following an ice breaker must not overtake one another.

7. Vessels following an ice breaker are to be ready to go full speed astern immediately.

8. Vessels proceeding in the ice in tow are not to go ahead with their engines without special orders. They must be constantly ready to cast off the towrope at the first request by the ice breaker, and also to go astern if the ice breaker stops in difficult (or heavy) ice.

9. Should a vessel following an ice breaker in the ice receive any damage or spring a leak, she must at once make the corresponding signal of distress by the International Code.

10. Should the captain of a vessel to which assistance is being rendered fail to carry out the orders given by the ice breaker, the captain of the ice breaker has the right to refuse further assistance until his orders have been carried out.

11. The ministry of trade and industry, in the person of its competent representative, is not responsible for damages which may be sustained by vessels when being assisted by an ice breaker.

12. Any vessel making use of the services of an ice breaker for passing through the ice by this very fact expresses assent to all the stipulations of these regulations.

SIGNALS.

Signals made by sound, to be used when vessels are being conducted through the ice.

No. of Signal.	Signal.	Meaning of signals if they are made by—	
		The conducting ice breaker.	The vessel.
I.	—	I am going ahead, follow me...	I am going ahead, follow the ice breaker.
II.	— —	Reduce your speed.....	I am reducing speed.
III.	— — — — —	I have stuck in the ice. Look out.	I have stuck in the ice. Look out.
IV.	— — —	Go full-speed astern.....	I am going full-speed astern.
V.	— — — —	Do not follow me. Stop.....	I am stopping.
VI.	— — — — —	Be ready to take towrope..... If the vessel is in tow: Cast off the towrope.....	I am ready to take towrope. The towrope is cast off.
VII.	— — — — —	Suspension of work until morning or until more favorable conditions. If work has been suspended, "Stand by."	
VIII.	Black cone, point upward, at the masthead.	Signal refers only to the vessel nearest to the ice breaker.	
IX.	Black cylinder, end upward, at the masthead.	Sound or other kind of signal refers to the ice breaker only.	

REMARKS.

(a) The conducting ice breaker is the ice breaker proceeding ahead of one or several vessels.

(b) A long line indicates a long sound; a short line, a short sound.

(c) If owing to the distance the ice breaker does not hear signal III made by a vessel, the latter will hoist a ball by day or a red light by night, which will remain in position until the ice breaker comes to her assistance.

(d) Signal V should be made also by all vessels in the ice in a channel during fog or snowstorm, in addition to the usual fog signal bell.

(e) When a vessel is too close to the ice breaker, the latter will display, astern, a red flag by day or a red light by night.

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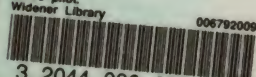
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